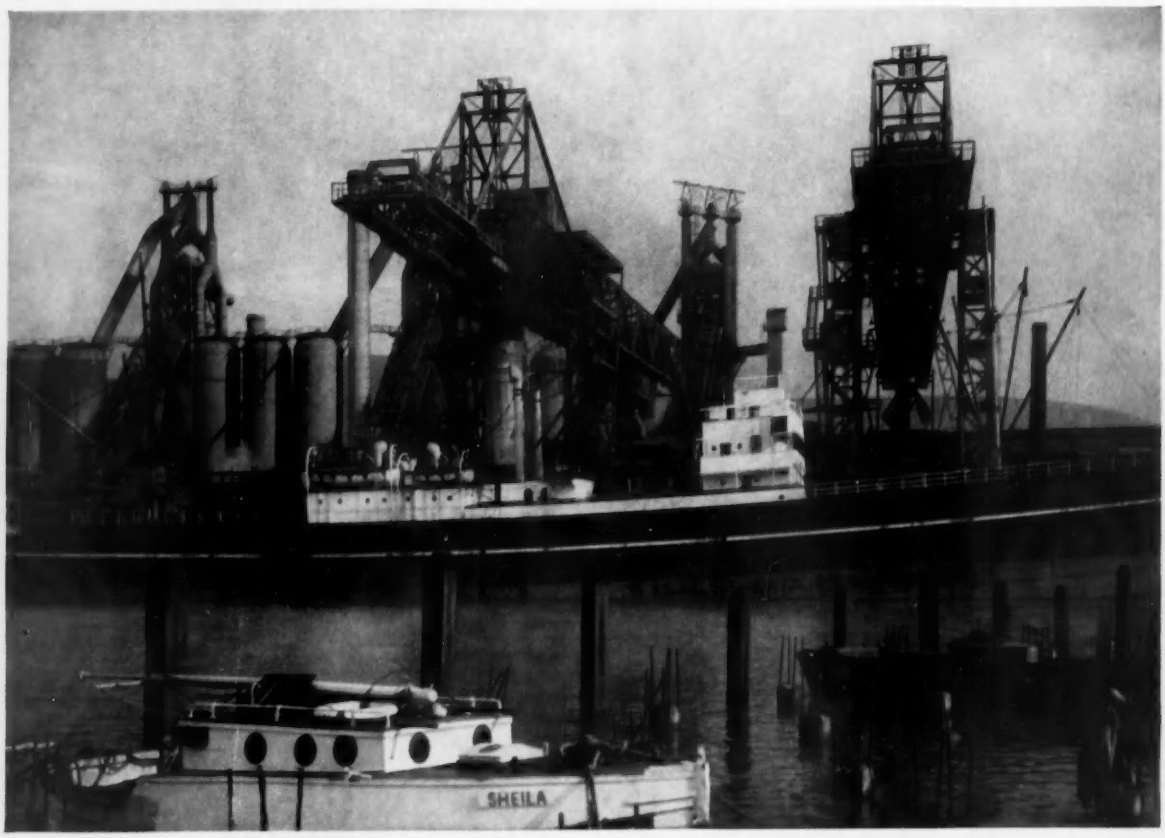
8 DECEMBER 1955 ONE SHILLING

ELECTRICAL TIMES



Giant Ore Unloaders use BICC CURRENT COLLECTION EQUIPMENT

Europe's largest steelworks—the Margam-Abbey Works of the Steel Company of Wales — has a daily consumption of iron ore that is measured by the shipload.

Giant Ore Bridge Unloaders span the ships, stockyards and furnace bunkers at Port Talbot Docks. Electrically operated (at 3,300 volts) they are each capable of unloading ore at the rate of 500 *tons an hour.*

The Current Collection Equipment has been specially designed by BICC for high voltage operation, and to withstand the strain of continuous use in a marine and abrasive atmosphere.

BICC specialise in the design and supply of Current Collection systems for all types of cranes and conveyors. Publication No. 271, available on request, tells you more about the range of this equipment.

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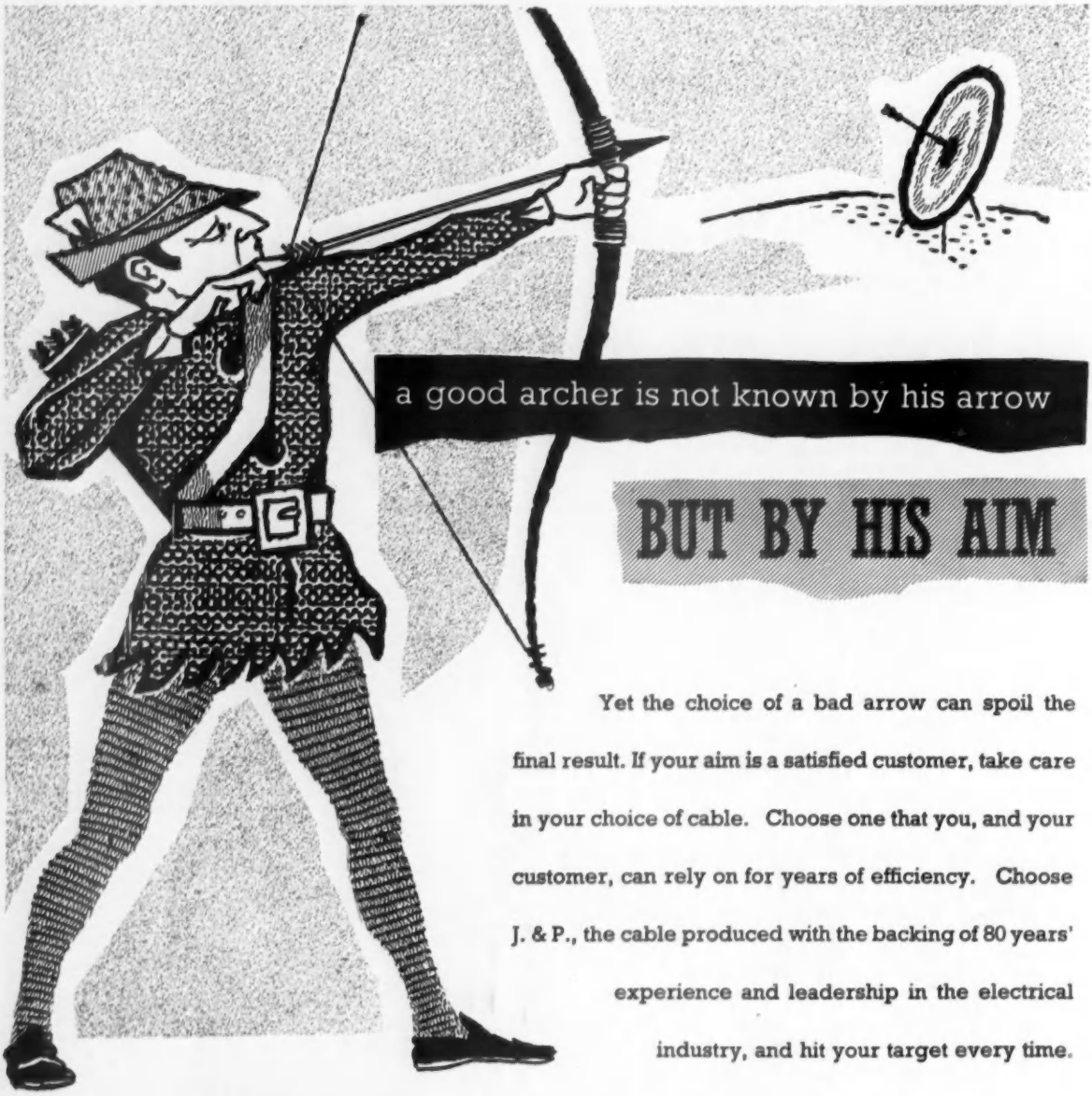

a good archer is not known by his arrow

BUT BY HIS AIM

Yet the choice of a bad arrow can spoil the final result. If your aim is a satisfied customer, take care in your choice of cable. Choose one that you, and your customer, can rely on for years of efficiency. Choose J. & P., the cable produced with the backing of 80 years' experience and leadership in the electrical industry, and hit your target every time.

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STEEL-FRAME MOTORS, adaptable to most industrial drives, seek work. Highest references and qualifications, including N.E.M.A., B.S.D., B.S.2613, etc. Available in a few days. Full particulars from Laurence, Scott & Electromotors Ltd., Norwich.

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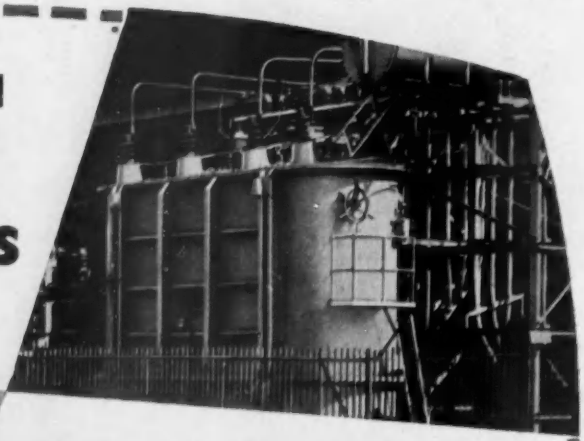
An advertisement by LAURENCE, SCOTT & ELECTROMOTORS Ltd., who have been putting the right motors (and control gear) to work in the right jobs since 1883.

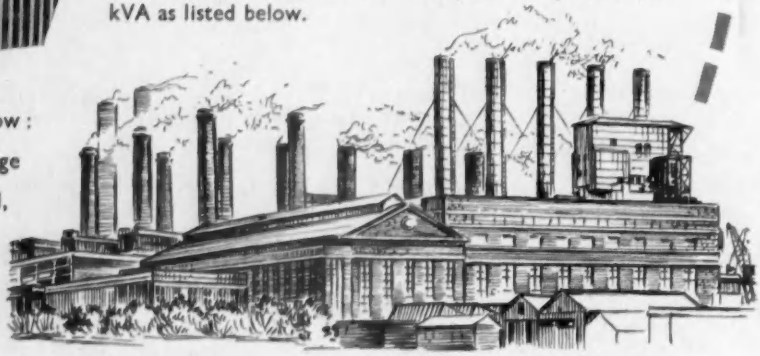
over A MILLION kVA of HACKBRIDGE TRANSFORMERS installed at



BARKING POWER STATION LONDON

HACKBRIDGE TRANSFORMERS have been installed at Barking Power Station over a period of a quarter of a century and include units in capacities up to 93,750 kVA as listed below.

The installations illustrated show: above, one of the four Hackbridge 93,750 kVA transformers, and, below, one of the three 88,750 kVA Units at Barking Power Station, London.



Four 93,750 kVA	Two 12,500 kVA	Four 600 kVA
Three 50,000 kVA	Two 10,000 kVA	Four 900 kVA
Three 88,750 kVA	Five 7,500 kVA	Four 250 kVA
Four 30,000 kVA	Four 4,500 kVA	Four 150 kVA

Also other miscellaneous units totalling 4,000 kVA

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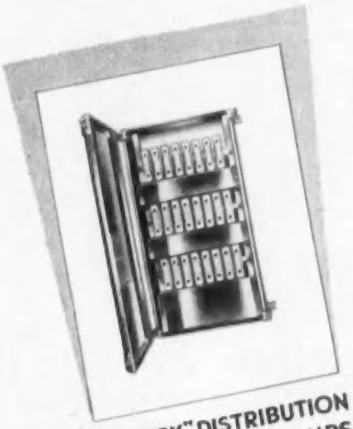
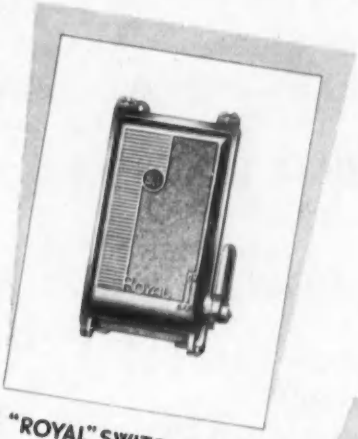
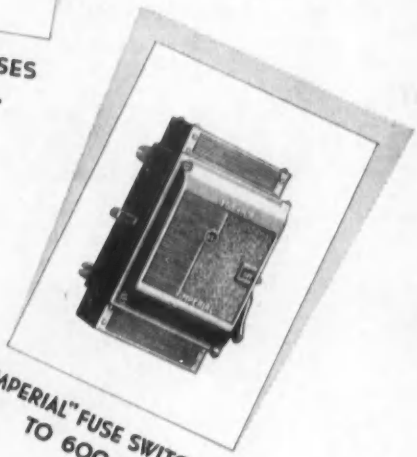
BILL COMPLETE INDUSTRIAL INSTALLATION



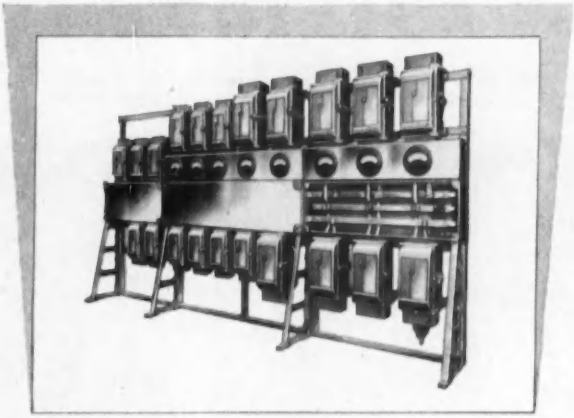
BILL "VERTEX" DISTRIBUTION BOARDS TO 300 AMPS.



BILL "ROYAL" SWITCHFUSES TO 100 AMPS.



BILL "IMPERIAL" FUSE SWITCHES TO 600 AMPS.



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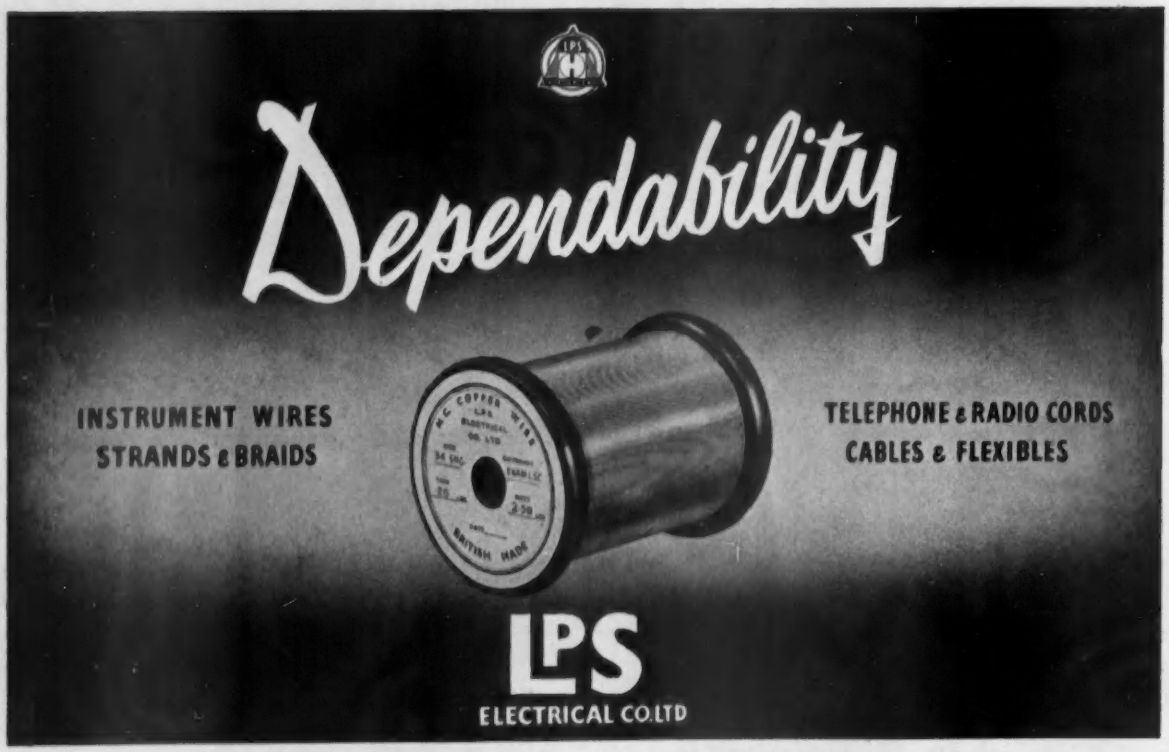

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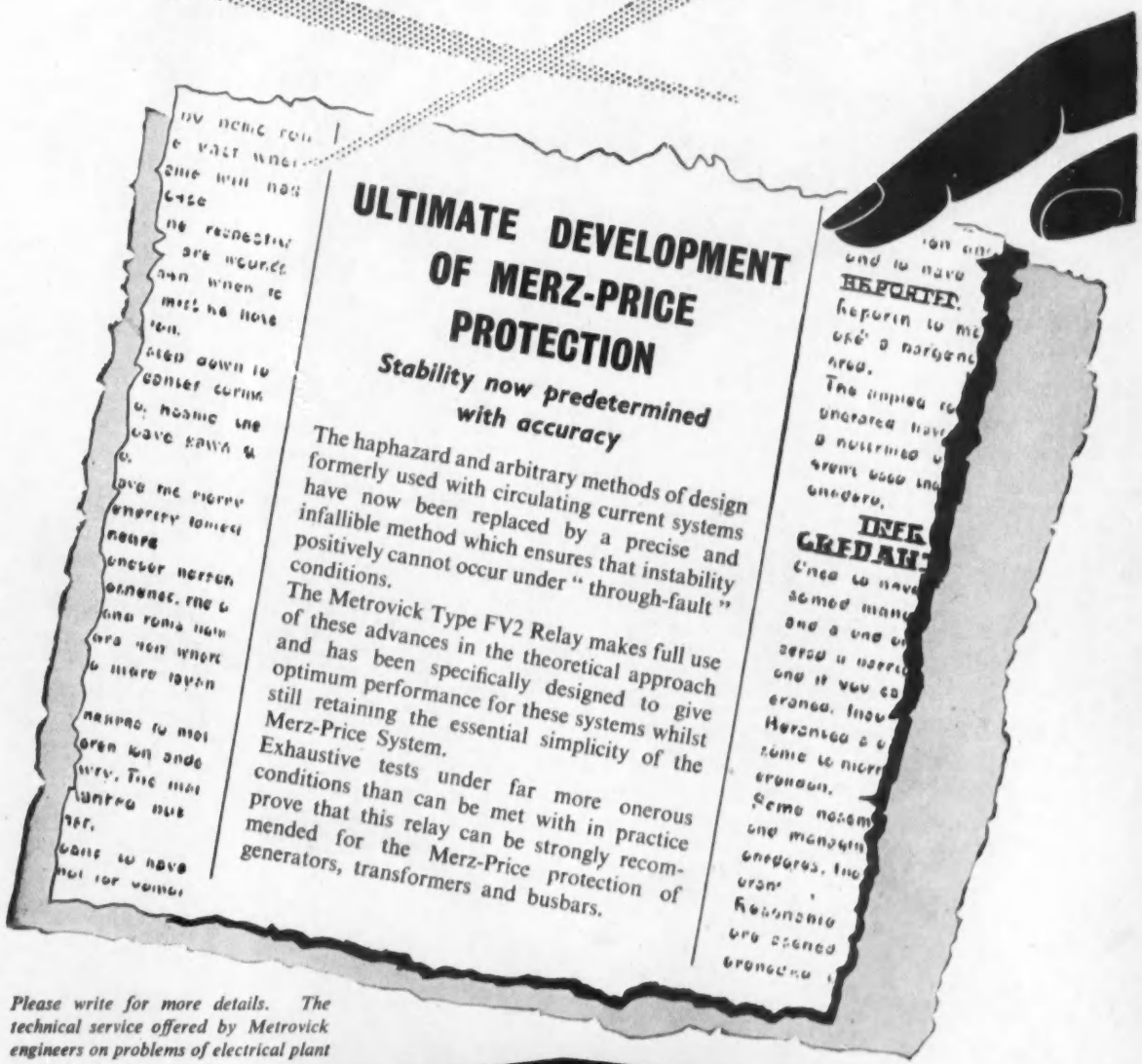
Telephone: Covent Garden 3232 (7 lines). 'Grams: Engineyer, Phone, London. Also Works at St. Leonards-on-Sea

New relay makes news!


ULTIMATE DEVELOPMENT OF MERZ-PRICE PROTECTION
Stability now predetermined with accuracy
The haphazard and arbitrary methods of design formerly used with circulating current systems have now been replaced by a precise and infallible method which ensures that instability positively cannot occur under " through-fault " conditions.
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Exhaustive tests under far more onerous conditions than can be met with in practice prove that this relay can be strongly recommended for the Merz-Price protection of generators, transformers and busbars.

Please write for more details. The technical service offered by Metrovick engineers on problems of electrical plant protection is unsurpassed.

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A403

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Brush Square Path Alternators are built in a wide range of sizes with outputs from 1½ to 35kVA, self-regulating, self exciting. All Brush built alternators can be supplied complete with " Brush " Control Switchgear.

You get exactly what you want from **BRUSH**

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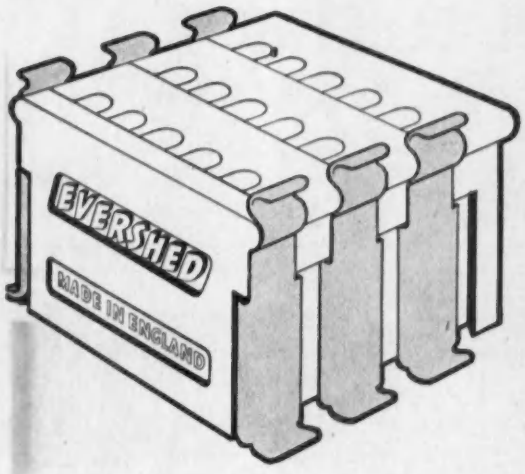
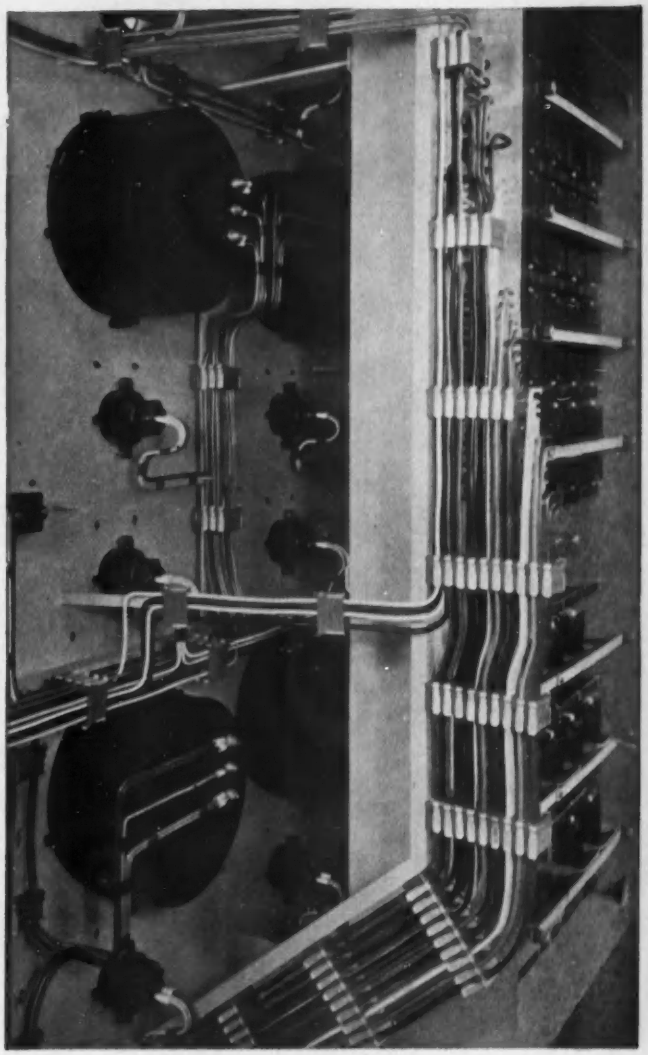
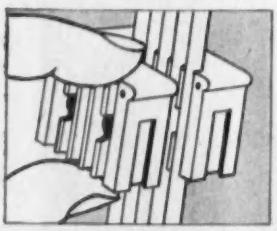
Introducing the EVERSHED *improved* CLEAT



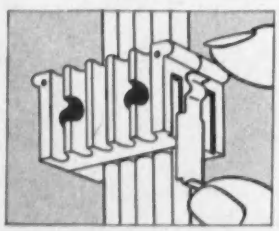


The problem of neatly securing wires in electrical apparatus particularly where intricate and large wiring circuits are involved has been solved by the introduction of the Evershed Cable Cleat. This specially designed moulded cleat neatly secures the wires at the same time permitting easy inspection and maintenance. The illustrations below show how simple the cleats are to assemble.

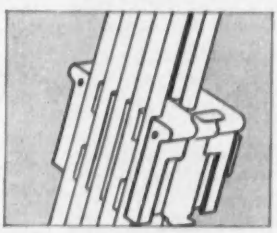
Full details can be had in Publication J055.



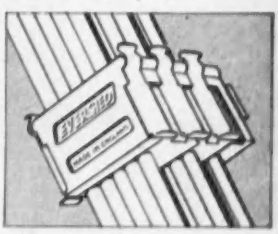
The base of the Cleat is bolted to an upright. Wires are laid in the channels and the next cleat placed in position.



Clips glide into dove-tail grooves holding the two Cleats together. No other fixing is necessary.



The operation is repeated and a further set of five wires are positioned in the channels.



A set of three cleats and end plate in position.

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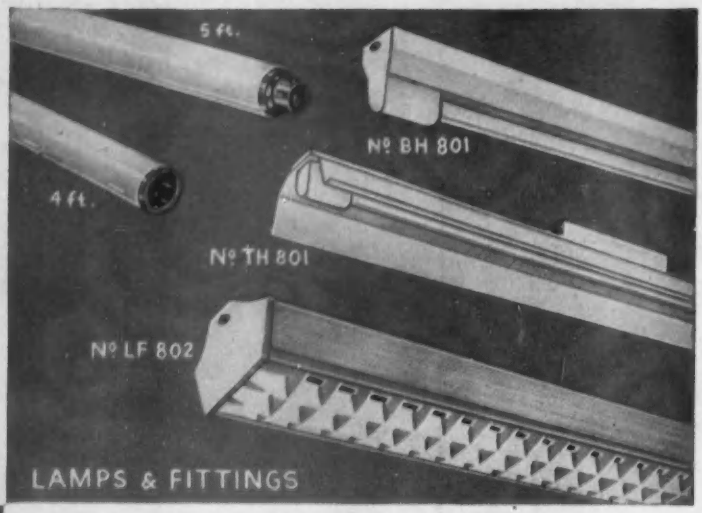

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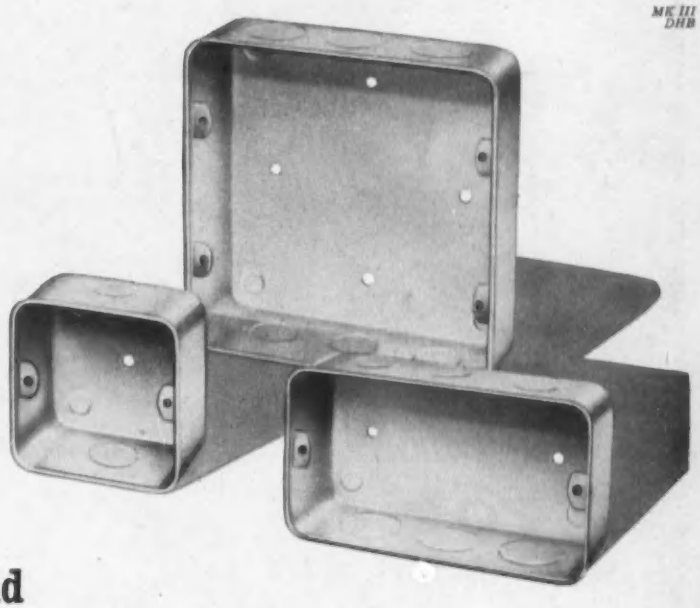

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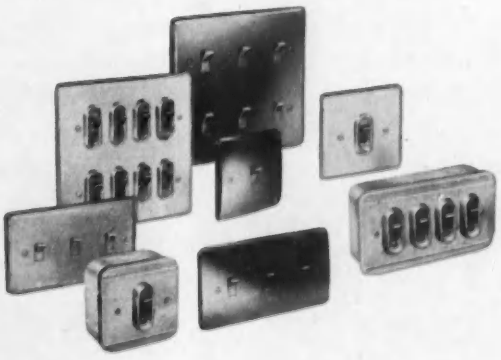

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Now what on earth, you may ask, have bluebells to do with batteries? Well . . . if you were with us in Alton this evening it would be easier to explain. That grizzled character at the end of the bar—the one with 'Prickly—handle with care' written all over him. Hard to picture him knee-deep in bluebells and picking like billy-oh. But that is how his father saw him, under the beeches in Dogford wood, some distant Sunday in May. As surely as he himself saw his own son—that chap by the dartboard, the one with the light ale. Dogford wood is an Alton custom—as old as the Hampshire hills. Life, do you see, still has continuity down here. Continuity in birthplaceand occupation. Continuity in manual skills and a man's solid pride in them. Continuity, as the years have proved, in the workmanship that Alton men put into Alton batteries.

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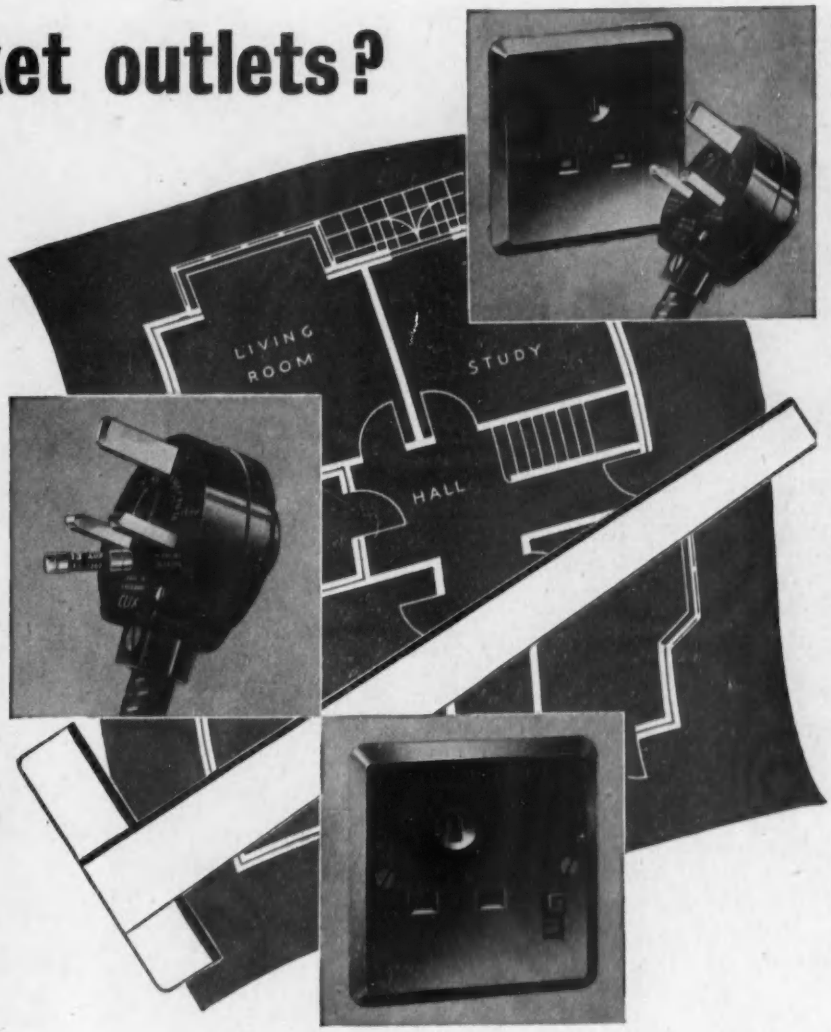
A27

how many socket outlets?



For an efficient and well-planned job make sure there are adequate numbers of Socket Outlets in each room, and remember to specify the Windsor range of Ediswan Accessories. These are quality Accessories at competitive prices, and the range includes all types of 13-amp. socket outlets, switch socket outlets and rectangular pin fused plugs for normal installations. The Ediswan plug that can be re-fused in 15 seconds, without the use of tools, is also available.

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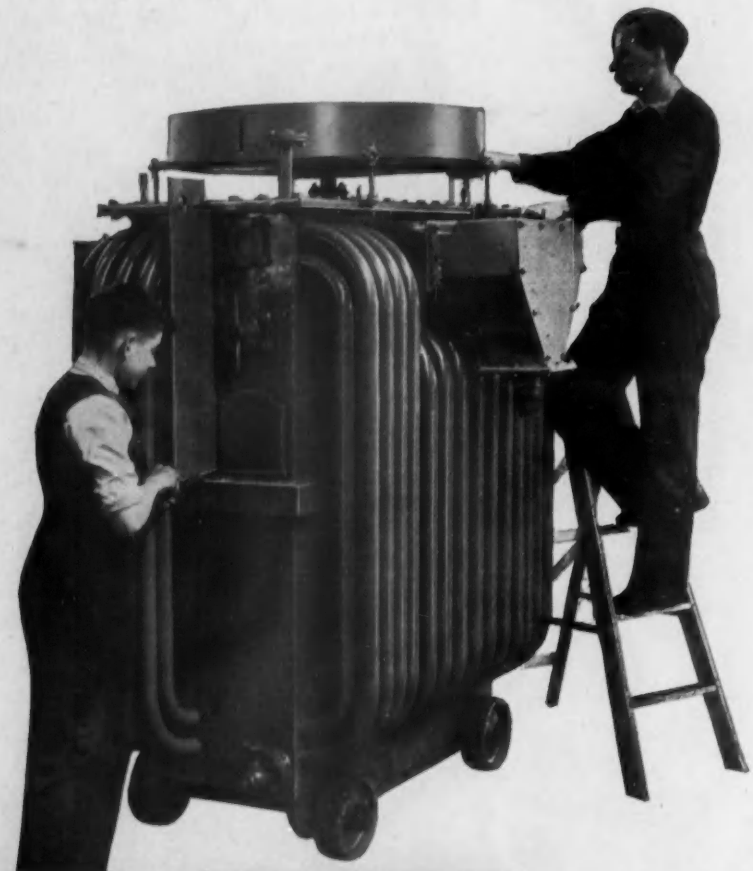
All our Hermetically sealed Transformers are guaranteed against moisture absorption and oil acidity for 10 years. All service engineers will realise that the capitalisation of their service charges for oil testing and filtration will more than outweigh the initial small extra cost.



This is a hermetically sealed 500 kVA 3 phase outdoor type transformer.

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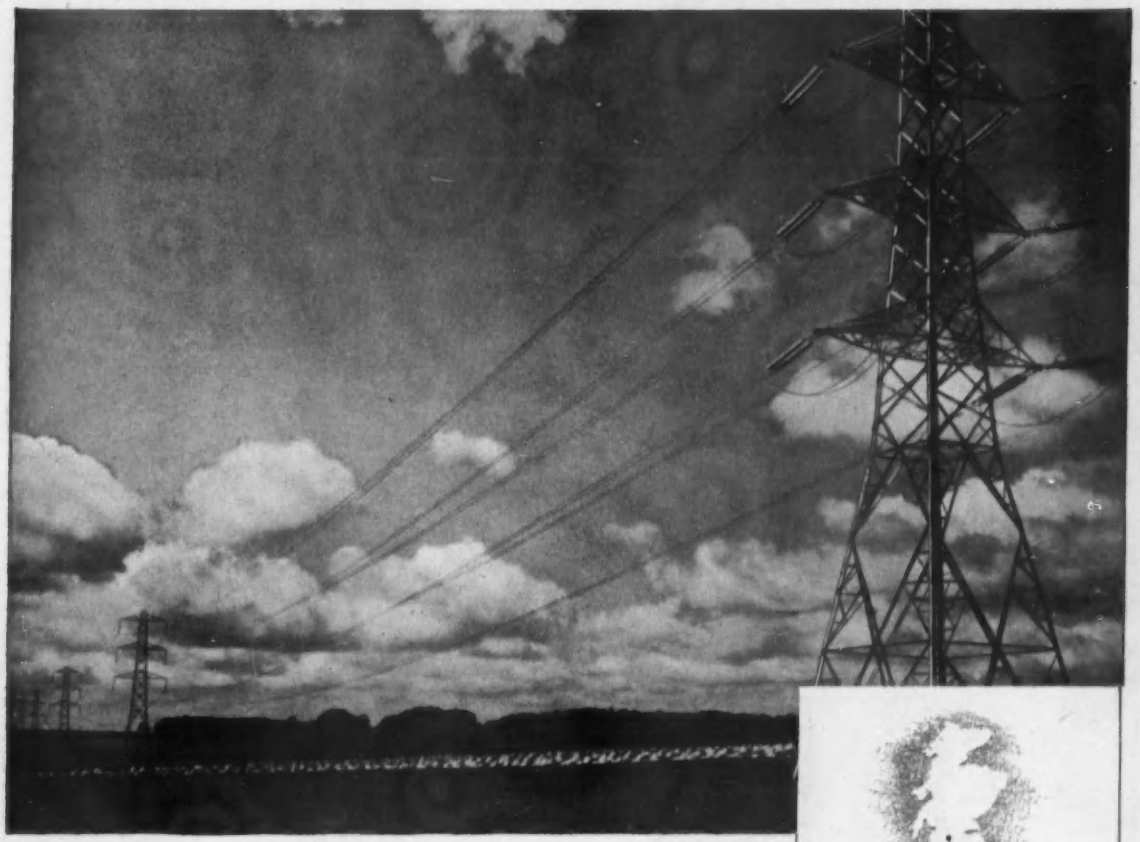

Sections of the 275kV Supergrid for which "Armourlight" Toughened Glass Insulators are being supplied.

For their 275 kV Supergrid, the Central Electricity Authority is using chiefly "ARMOURLIGHT" Toughened Glass Insulators. Their high electrical and mechanical strength means trouble-free operation. Over 550,000 "ARMOURLIGHT" Insulators are being supplied for this great project—they are helping to extend a network of high voltage lines from Clydeside to the Thames. "ARMOURLIGHT" Toughened Glass Insulators have a high resistance to power arcs and are unpuncturable by lightning surges. Their special glass construction enables a damaged unit to be detected by quick visual inspection from the ground. Leading Electrical Authorities throughout the world are using ever-increasing quantities of "ARMOURLIGHT" Toughened Glass Insulators.

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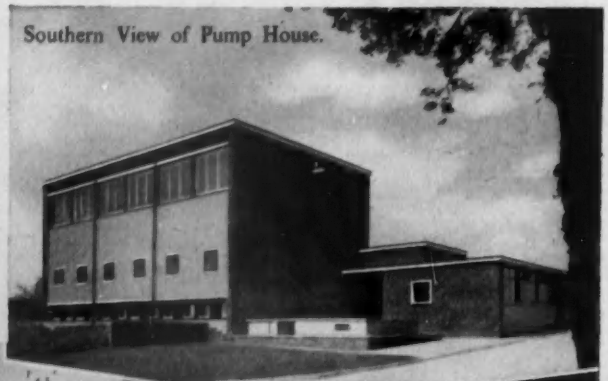
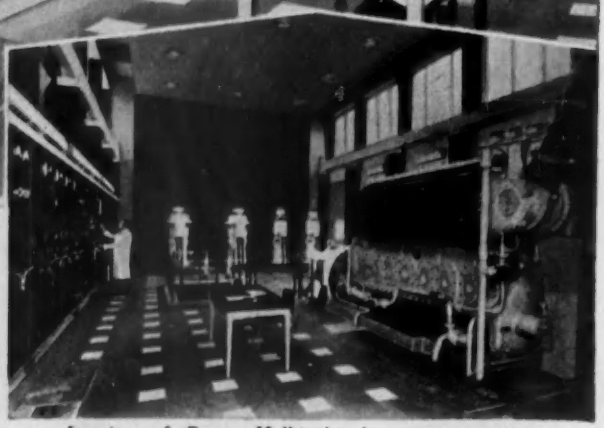
Main Contractors: Sulzer Bros. (London) Ltd.
Main Electrical Contractors: Messrs. Lancashire Dynamo & Crypto Ltd.



Southern View of Pump House.

"The illustration above shows the main switchboard which is arranged for receiving current either from the Grid Supply or from a Diesel Alternator Set, and as well as controlling the Diesel Set and the four Pump Motors, can also transmit power from either source to a future Pumping Station. The switchboard has also mounted on it various water level and flow instruments. The Motor Control Units were also supplied by us"



Interior of Pump Hall, showing pump motors, Diesel-Alternator & Control panel.

ERSKINE, HEAP & Co LTD

SWITCHGEAR SPECIALISTS

Head Office & Works
BROUGHTON, MANCHESTER (7)

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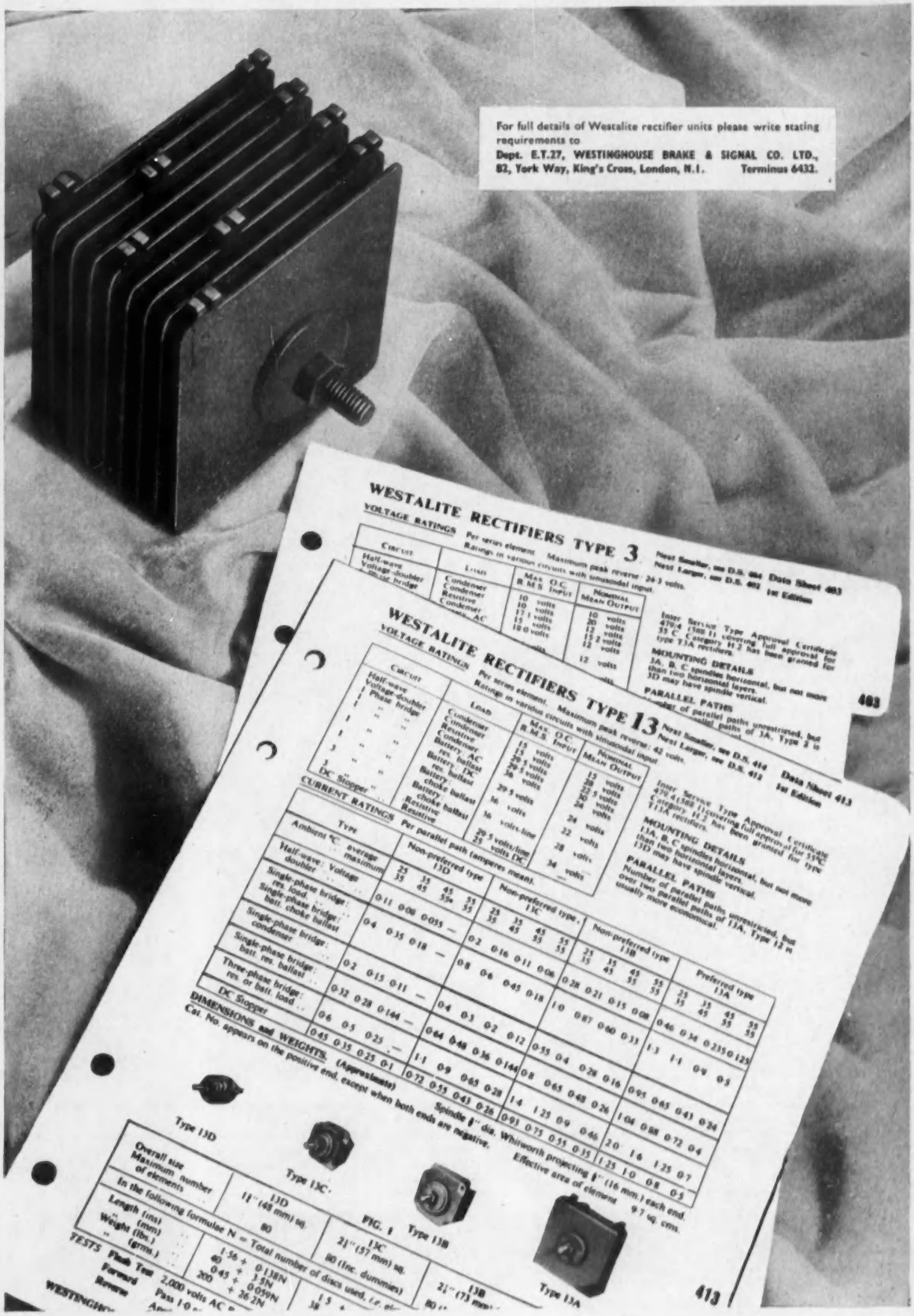
GRAND BUILDINGS, TRAFALGAR SQ., W.C.2

BRANCH OFFICES AND AGENCIES IN ALL PARTS OF THE WORLD

708



For full details of Westalite rectifier units please write stating requirements to
Dept. E.T.27, WESTINGHOUSE BRAKE & SIGNAL CO. LTD., 82, York Way, King's Cross, London, N.1. Terminus 6432.

WESTALITE RECTIFIERS TYPE 3

Next Smaller, see D.S. 414 Next Larger, see D.S. 413 Data Sheet 403 1st Edition

VOLTAGE RATINGS Per series element. Maximum peak reverse 34·3 volts. Ratings in various circuits with sinusoidal input.

Circuit	Load	Max. D.C. R.M.S. Input	Nominal Mean Output
Half-wave	Condenser	10 volts	10 volts
Voltage-doubler	Condenser	10 volts	20 volts
Bridge	Resistive	11·1 volts	12 volts
	Condenser AC	15 volts	13·2 volts
		18·0 volts	12 volts

Inter Service Type Approval Certificate 4704 (1948) 11 covering full approval for 35° C. Category H 2 has been granted for type 3 3A. rectifiers.

MOUNTING DETAILS
3A., B., C. spindles horizontal, but not more than two horizontal layers.
3D may have spindle vertical.

PARALLEL PATHS
Number of parallel paths unrestricted, but over two parallel paths of 3A. Type 3 is usually more economical.

403

WESTALITE RECTIFIERS TYPE 13

Next Smaller, see D.S. 414 Next Larger, see D.S. 413 Data Sheet 413 1st Edition

VOLTAGE RATINGS Per series element. Maximum peak reverse: 48 volts. Ratings in various circuits with sinusoidal input

Circuit	Load	Max. D.C. R.M.S. Input	Nominal Mean Output
1 Half-wave	Condenser	15 volts	12 volts
1 Voltage-doubler	Condenser	15 volts	24 volts
1 Phase bridge	Resistive	29·5 volts	23·5 volts
2 " "	Condenser	29·5 volts	30 volts
3 " "	Battery, AC res. ballast	36 volts	24 volts
3 " "	Battery, DC choke ballast	29·5 volts	24 volts
3 " "	Battery, DC res. ballast	36 volts	22 volts
3 " "	Battery, DC choke ballast	36 volts-line	28 volts
3 " "	Resistive	29·5 volts/line	34 volts
DC Stopper		25 volts DC	

Inter Service Type Approval Certificate 4704 (1948) 11 covering full approval for 55° C. Category H 2 has been granted for type 13A. rectifiers.

MOUNTING DETAILS
13A., B., C. spindles horizontal, but not more than two horizontal layers.
13D may have spindle vertical.

PARALLEL PATHS
Number of parallel paths unrestricted, but over two parallel paths of 13A. Type 13 is usually more economical.

CURRENT RATINGS Per parallel path (amperes mean).

Type	Non-preferred type 13D				Non-preferred type 13C				Non-preferred type 13B				Preferred type 13A			
Ambient °C. average	25	35	45	55	25	35	45	55	25	35	45	55	25	35	45	55
maximum	35	45	55	55	35	45	55	55	35	45	55	55	35	45	55	55
Half-wave: Voltage doubler	0·11	0·08	0·055	—	0·2	0·16	0·11	0·06	0·28	0·21	0·15	0·08	0·46	0·34	0·235	0·125
Single-phase bridge: res. load	0·4	0·35	0·18	—	0·8	0·6	0·45	0·18	1·0	0·87	0·60	0·33	1·3	1·1	0·9	0·5
Single-phase bridge: batt. choke ballast	0·2	0·15	0·11	—	0·4	0·3	0·2	0·12	0·55	0·4	0·28	0·16	0·95	0·65	0·41	0·24
Single-phase bridge: condenser	0·32	0·28	0·144	—	0·64	0·48	0·36	0·144	0·8	0·65	0·48	0·26	1·04	0·88	0·72	0·4
Three-phase bridge: batt. res. ballast	0·6	0·5	0·25	—	1·1	0·9	0·65	0·28	1·4	1·25	0·9	0·46	2·0	1·6	1·25	0·7
Three-phase bridge: res. or batt. load	0·45	0·35	0·25	0·1	0·72	0·55	0·43	0·26	0·93	0·75	0·55	0·35	1·25	1·0	0·8	0·5
DC Stopper																

DIMENSIONS and WEIGHTS. (Approximate)

	Type 13D	Type 13C	Type 13B	Type 13A
Overall size	1¼" (48 mm) sq.	2¼" (57 mm) sq.	2¼" (57 mm) sq.	2¼" (57 mm) sq.
Maximum number of elements	80	80 (inc. dummies)	80 (inc. dummies)	80 (inc. dummies)
In the following formulae N = Total number of discs used, i.e. el...				
Length (ins)	1·56 + 0·138N	1·5 + 0·138N	1·5 + 0·138N	1·5 + 0·138N
(mm)	40 + 3·5N	38 + 3·5N	38 + 3·5N	38 + 3·5N
Weight (lbs.)	0·45 + 0·059N	0·45 + 0·059N	0·45 + 0·059N	0·45 + 0·059N
(grms.)	205 + 26·7N	205 + 26·7N	205 + 26·7N	205 + 26·7N

TESTS Flash Test Forward 2,000 volts AC Pass 10 ... Reverse Ap...

WESTINGHOUSE ...

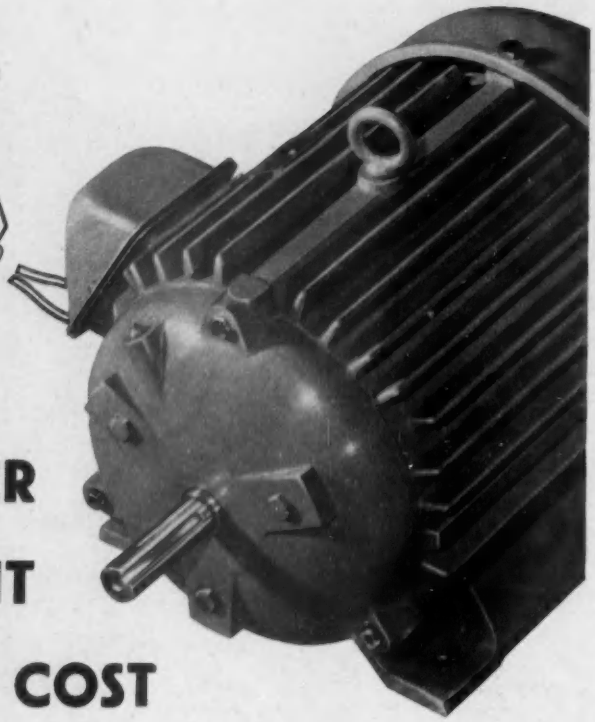
Spindle ¼" dia. Whitworth projecting ¼" (16 mm.) each end. Effective area of element 9·7 sq. cms.

FIG. 1 Type 13D Type 13C Type 13B Type 13A

413

FACTS ABOUT ELECTRIC MOTORS

TOTALLY ENCLOSED FAN COOLED TO BRITISH STANDARD 2083:1954

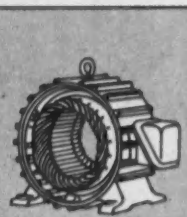
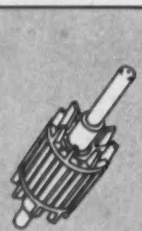


BROOK MOTORS Ltd

TOUGHER

MORE EFFICIENT

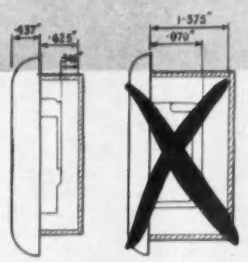
LOW IN COST

FRAMES	INSULATION	COILS	ROTOR	BEARINGS
				
Rigid cast iron. Designed to hold bearing alignment and prevent distortion under normal operating conditions. Dust-tight.	Slot design eliminates pockets where dirt can collect. Synthetic resin covered wire enables more copper to be packed in the slots.	Continuous wound coil groups assure positive current flow through windings and eliminate the connections between coils.	One-piece indestructible aluminium rotor with integrally cast fan which dissipates heat quickly. Dynamically balanced.	Cartridge type housings with ample grease capacity and felt seals.

BROOK MOTORS LIMITED
HUDDERSFIELD

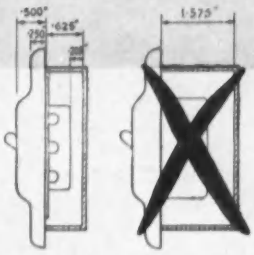
55/2

Time Saving with Plaster Depth Accessories



Note the 'plaster depth' socket on left, compared with normal flush socket

Volex



Note the 'plaster depth' switch on left, compared with normal flush switch

PLASTER DEPTH

13 amp. SOCKETS TO B.S.S. 1363 · 5 amp. SWITCHES TO B.S.S. 1299

Ceramic Interiors

✳ NO "CHASING" (BRICK CUTTING) ✳ ONLY ⅜ in. DEEP, THE USUAL DEPTH OF PLASTER

✳ AMPLE SPACE WITHIN BOX FOR WIRING ✳ SAME BOX FOR BOTH SOCKETS OR SWITCHES

To the busy Contractor "Volex" plaster depth Switches and Sockets are positive time savers having been designed strictly in accordance with his requirements and enabling them to be mounted within the normal depth of plaster without "chasing".

Any box having fixing centres to B.S.S. 1299 and a minimum depth of ⅝in. can be used for either socket or switch leaving ample space within the box for cable slack.

Switches and plates are composite units allowing self-adjustment to variations of plaster thickness.

Contacts are silver faced and all current carrying parts are mounted on CERAMIC BASES.

Terminals are easily accessible and of generous dimensions.

Two switches can be mounted in a 1-Gang box and 3 or 4 switches in a 2-Gang box to B.S.S. 1299.

Brown or Cream finish.

Volex VOLEX ELECTRICAL PRODUCTS LTD
SALFORD 6

Telephone: PENdleton 4373 Telegrams: 'VOLEXPROD', Salford 6

B

Early achievements in Industrial Electronics

Number Four in a series

BTH have played a major role in the development of electronic engineering. Nearly 50 years ago research work was already under way at the Rugby Works. The work of those early days led to the design and manufacture during the first Great War of thermionic valves for military equipment.

Since then, BTH electronic equipment has occupied a leading position and earned for itself an outstanding reputation for reliability. Twenty years after their original installation many BTH electronic installations are still in active, daily use. There could be no greater tribute than this to the design and reliability of BTH industrial electronic equipment.

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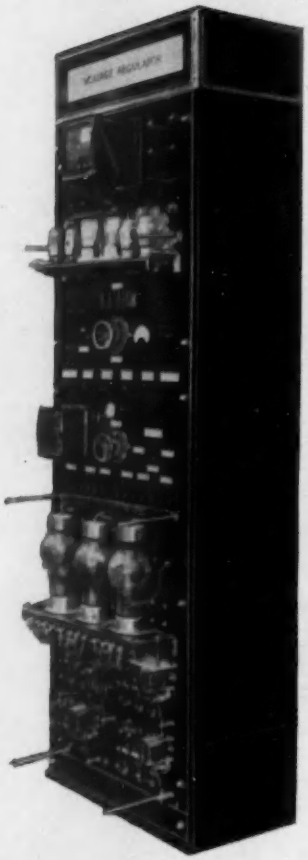
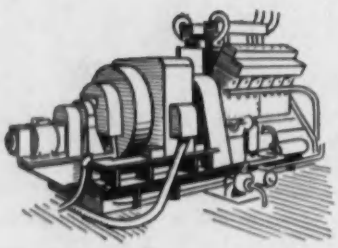


Voltage Control in power houses



can be performed efficiently and accurately by thyratron voltage regulators. In 1938 a BTH thyratron voltage regulator was installed in Messrs. Harris Lebus' power house, arranged to control the voltage of approximately 5,000 kW. Two of the alternators were turbine driven—the other two were powered by reciprocating engines. The four machines are chiefly used to supply the wattless kVA of the load, and the regulator was therefore arranged to maintain the power factor of the incoming supply (from the local Authority) between 95% and unity. During recent reconstruction of the power house the regulator was moved to a different position in the main switchboard, but is still giving excellent service. In fact, during seventeen years of operation only three new thyratrons have been required.

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the FOSTER WHEELER

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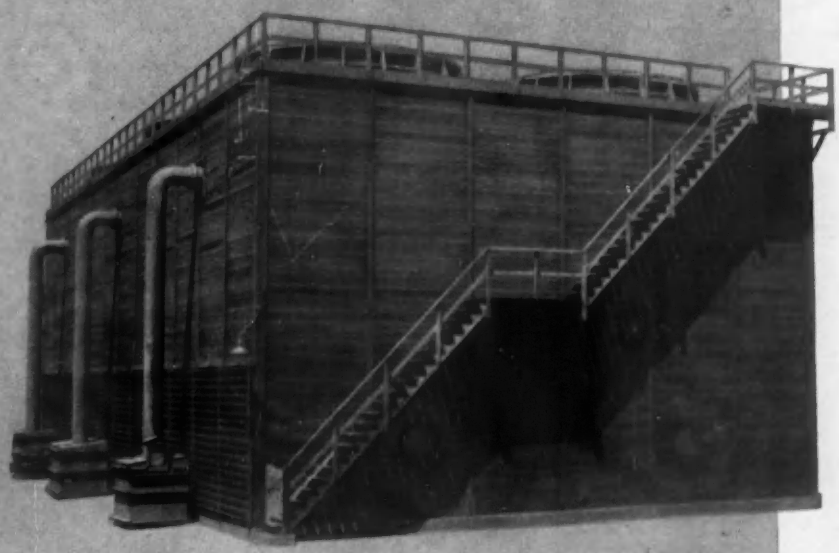
COUNTER-FLOW COOLING TOWER gives you



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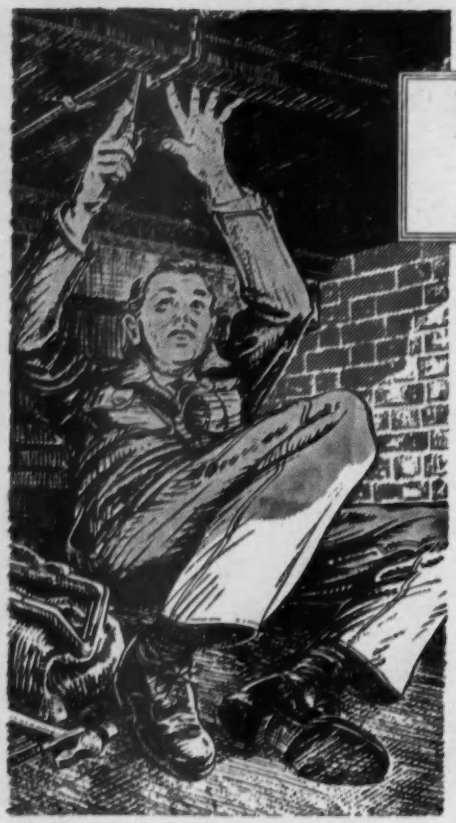

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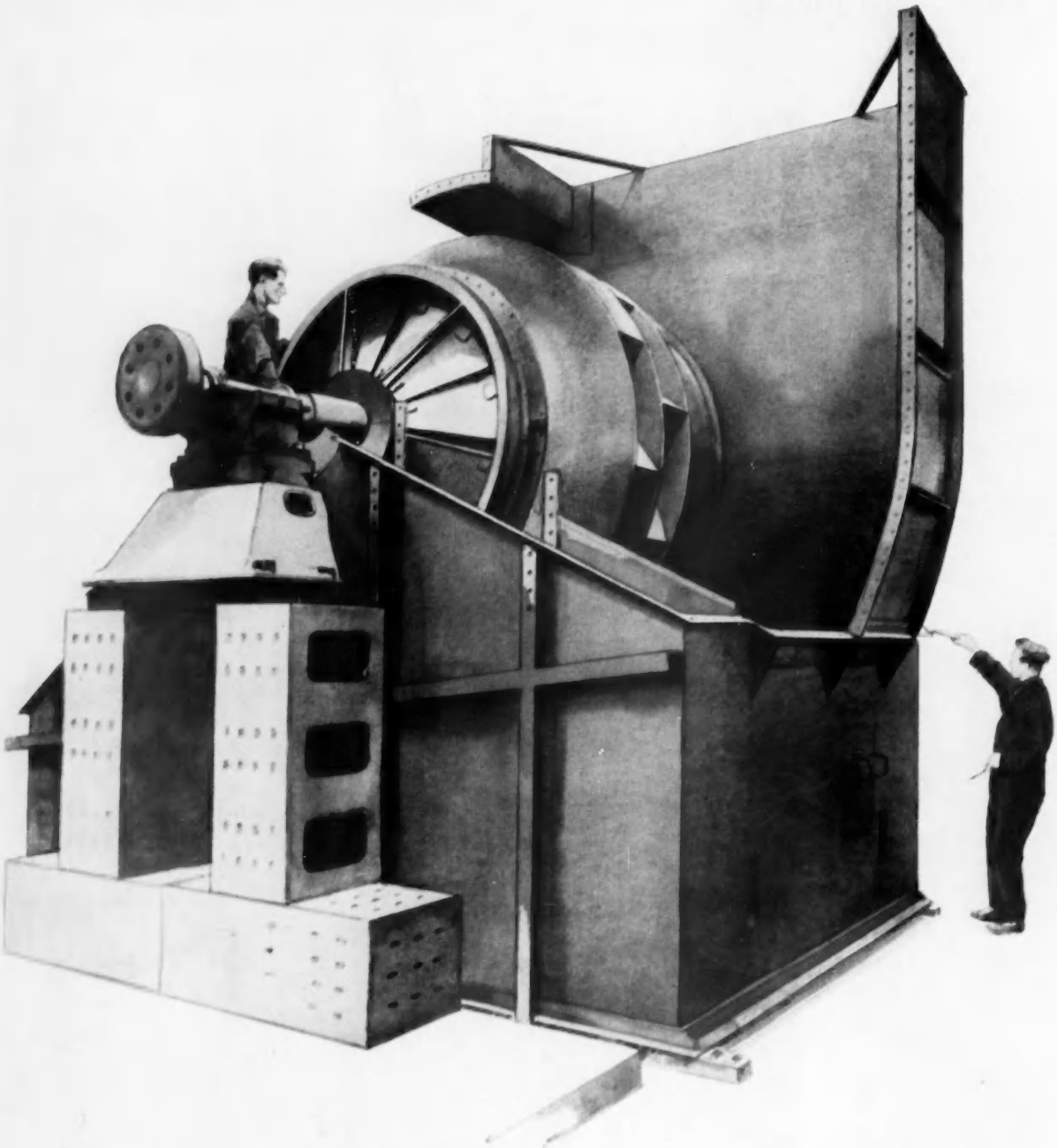

Assembling a Howden induced-draught fan with vane control

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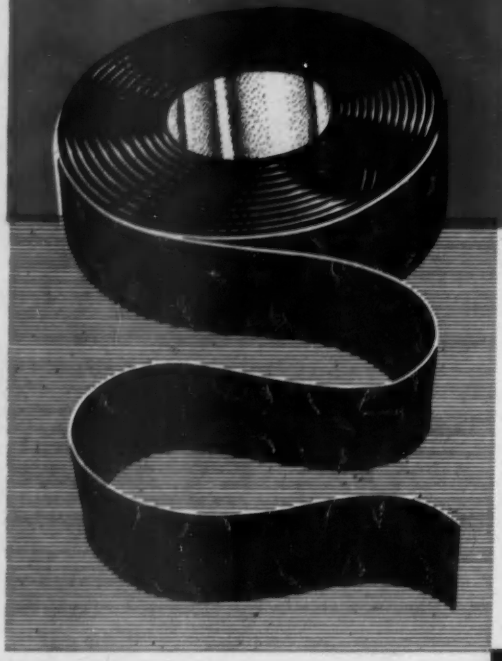

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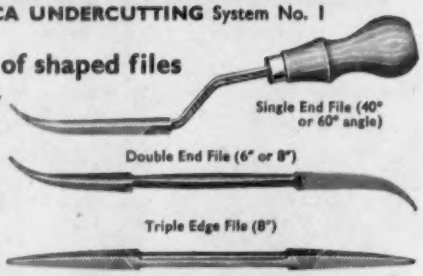
MARTINDALE

MICA UNDERCUTTING System No. 1

By the use of shaped files used either



BY HAND

or in

POWER TOOLS

With these files and power tools, mica undercutting is a quick and simple process and slots may be cut right up to the risers. The tools are so shaped that slots can usually be cut by working through the ventilating or other openings in the motor or generator frame, without the need for removing brush arms. The oscillating heads of the power tools are interchangeable with the milling heads of the Mica Millers used in the Martindale System No. 2.

Write for details of other Martindale Undercutters, Fault Finders, Commstones, etc.

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Economy in cost . . . these switch assemblies are highly competitive in price because of their considerably reduced size — AND there's a substantial saving in installation

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Protected, sheet-steel, or brass covers

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Brass or insulated overlapping plates

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1-12 GANG ASSEMBLIES STANDARD

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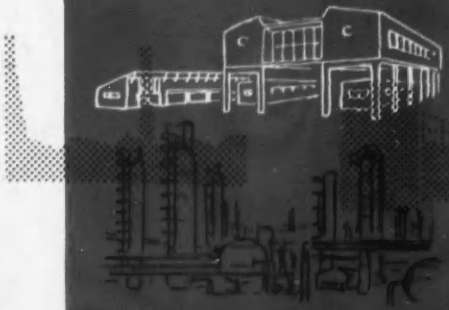

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there's a notion to give that
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SMITHS
Master clocks and time recorders

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HIGH CURRENT NEUTRAL LOOP IMPEDANCE AND CONTINUITY TESTER

This instrument will safely carry out tests on electrical installations and appliances as recommended in the I.E.E. Regulations, 13th Edition, 1955, Section 5.

Injects a current up to 20 amps into circuit under test at a voltage not exceeding 40 Volts A.C.

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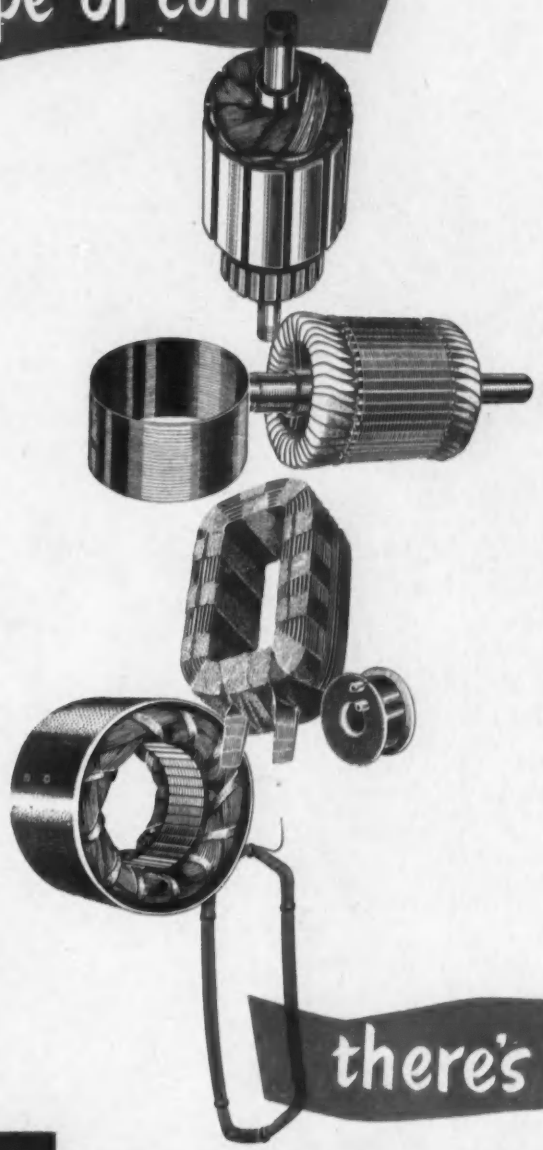
for every type of coil



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BICC WINDING WIRE

USE OUR TECHNICAL ADVISORY SERVICE

If you are faced with a winding problem please ask for assistance; BICC technicians are always willing to give you the benefit of their experience. For most winding wire jobs the Publications listed will provide the data you require. They are available on request.

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No. 296 "Bicaloc" Winding Wires (Self Bonding)
No. 303 Enamelled Oil Base Winding Wires
No. 322 "Bicalex" Winding Wires (Synthetic Enamel)
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CEA THERMAL EFFICIENCY TABLE FOR 1954-1955

Portobello was top of the list again, and — like last year — with a record thermal efficiency

Portobello generating station again achieved a record overall thermal efficiency of 31·42%.
High on the list were Littlebrook "B" 30·40%, Skelton Grange 28·89%, Brunswick Wharf 28·70% and Poole 28·31%.

FOR THREE YEARS RUNNING
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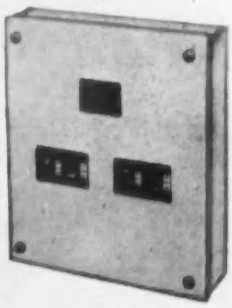

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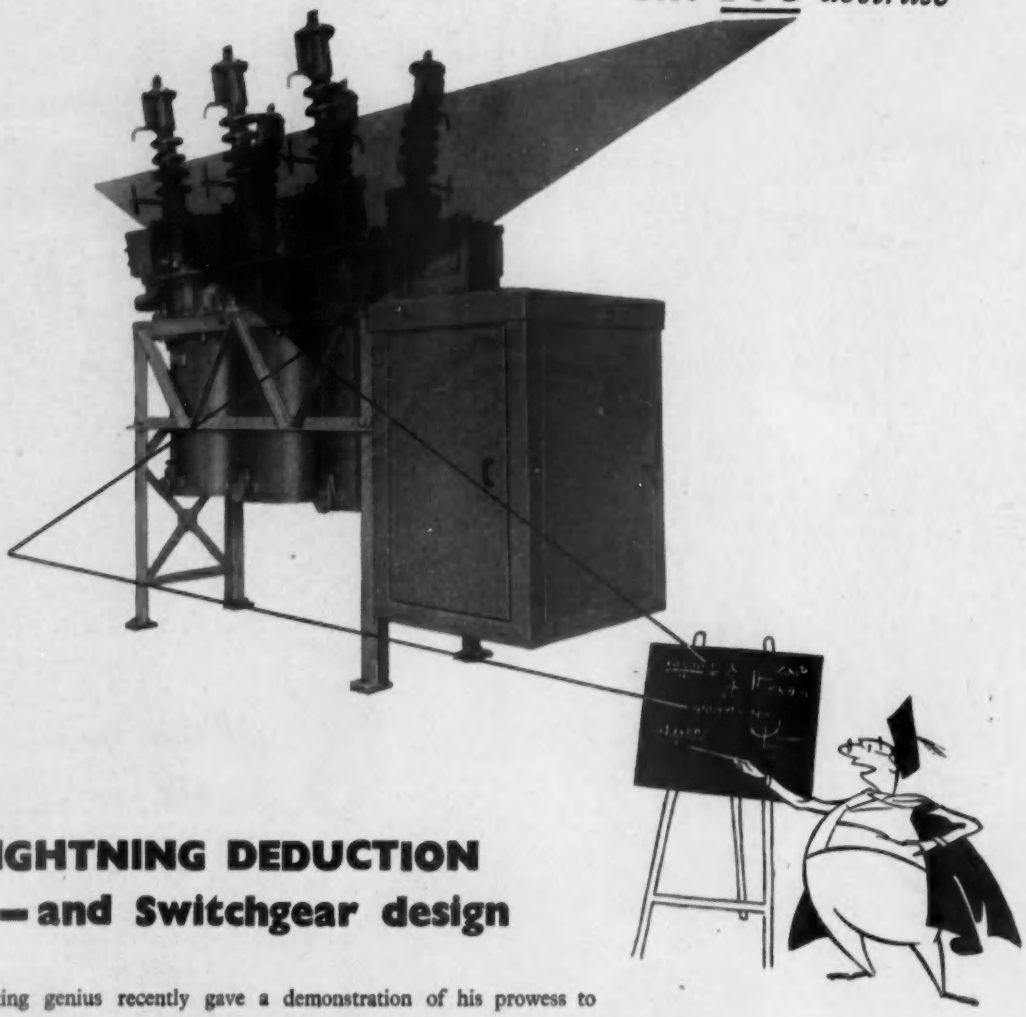

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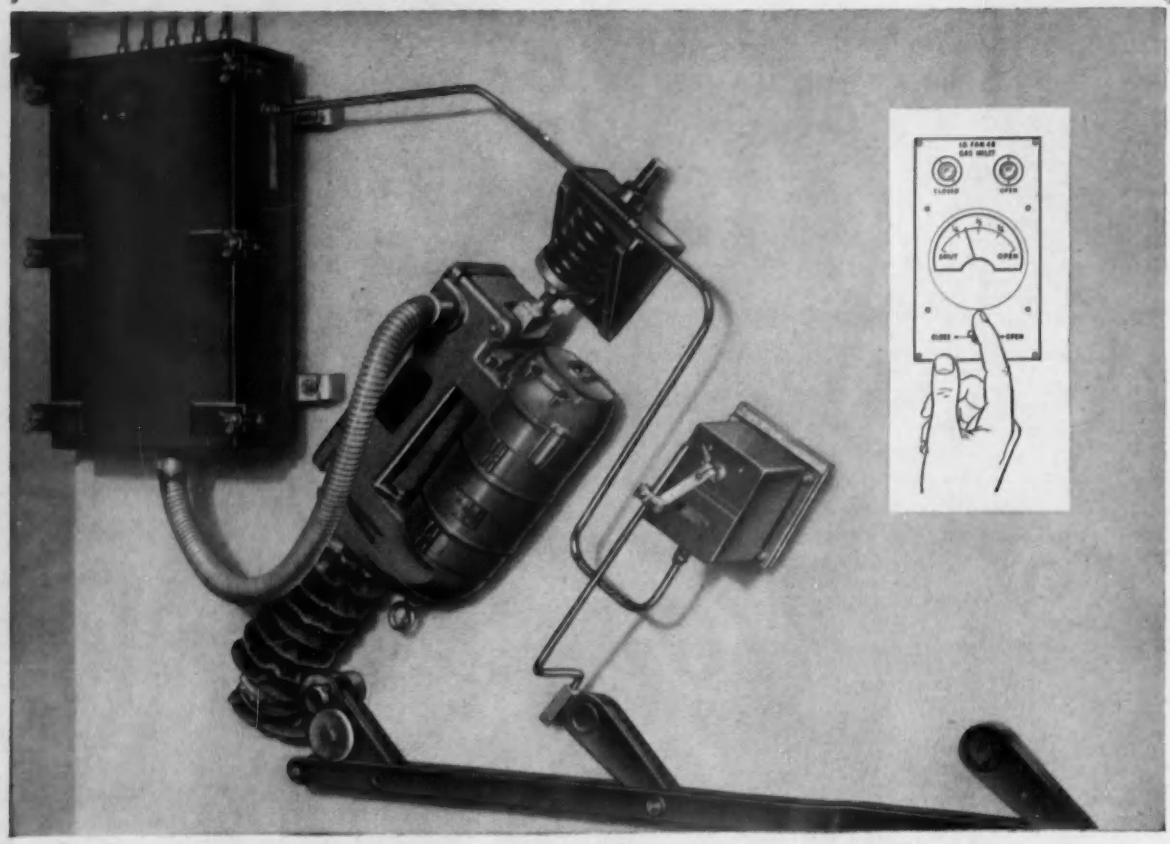

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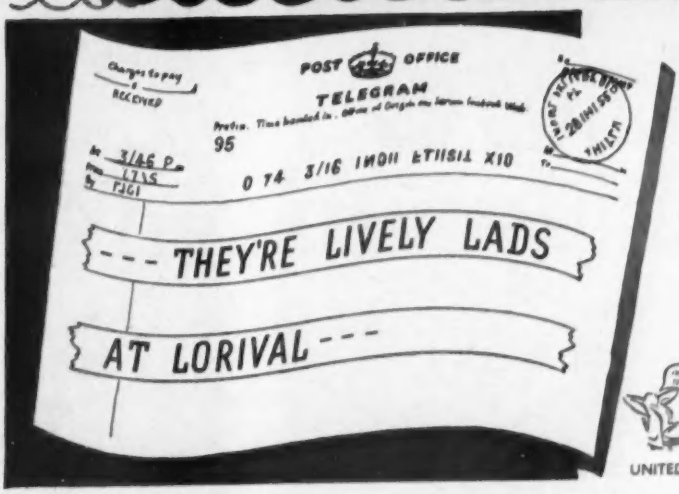

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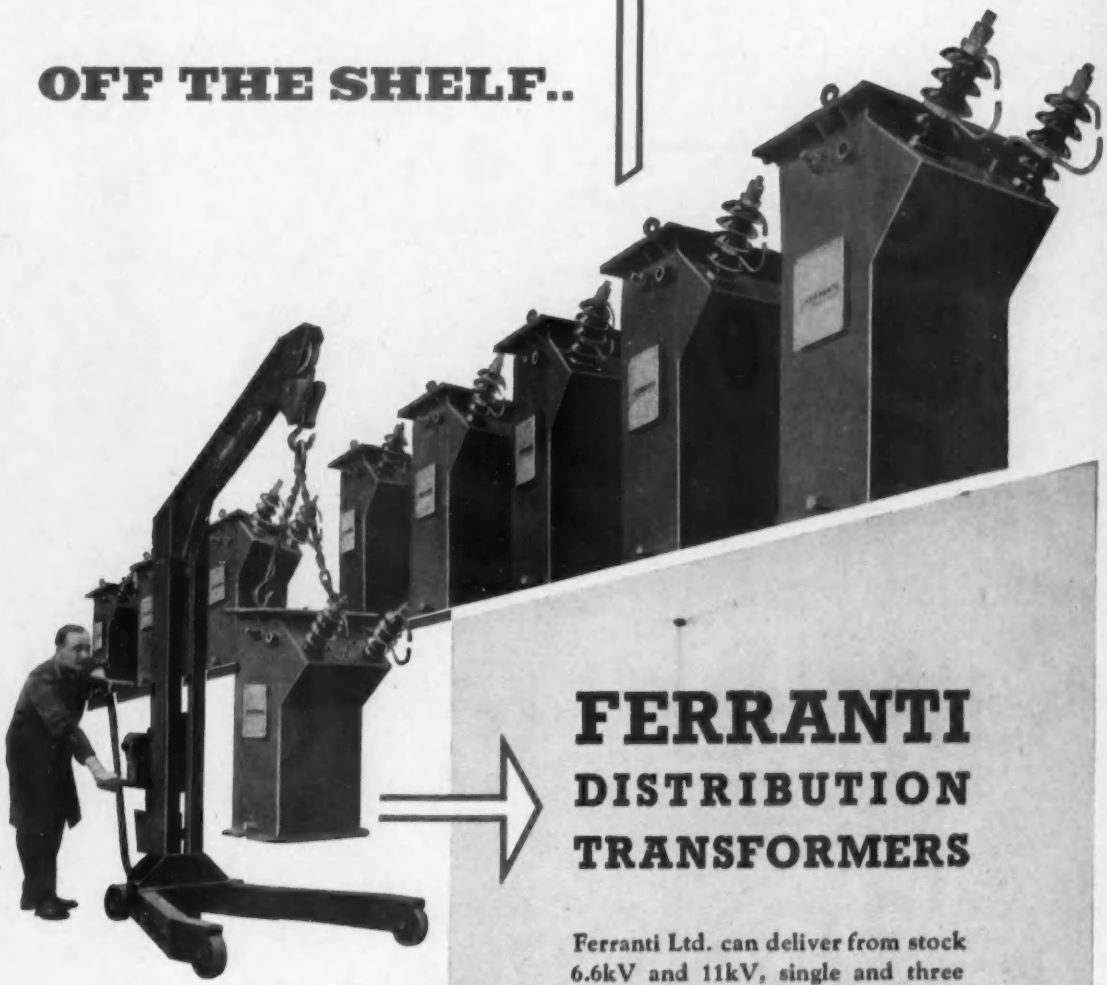

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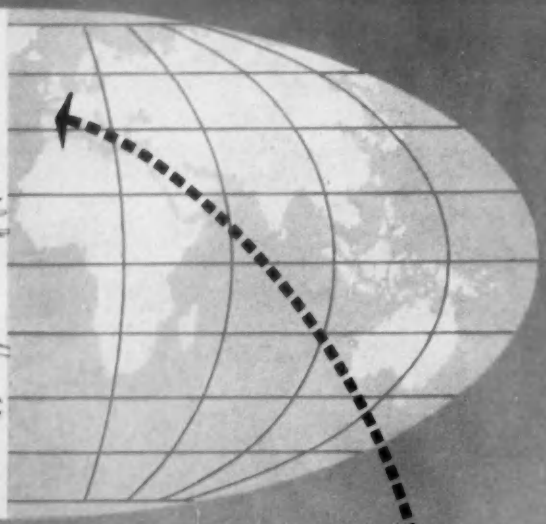

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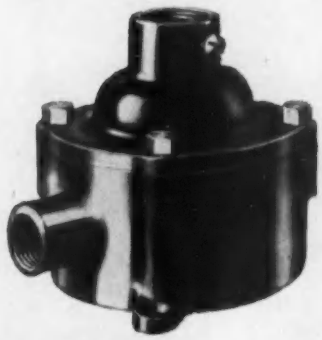

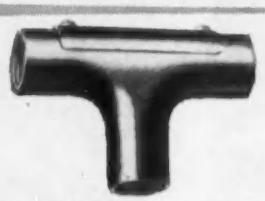

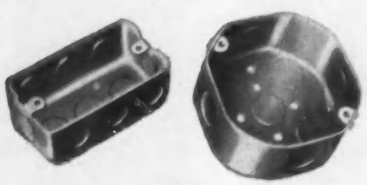

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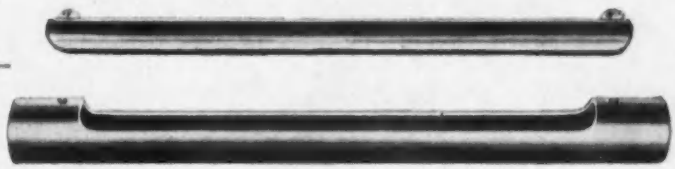

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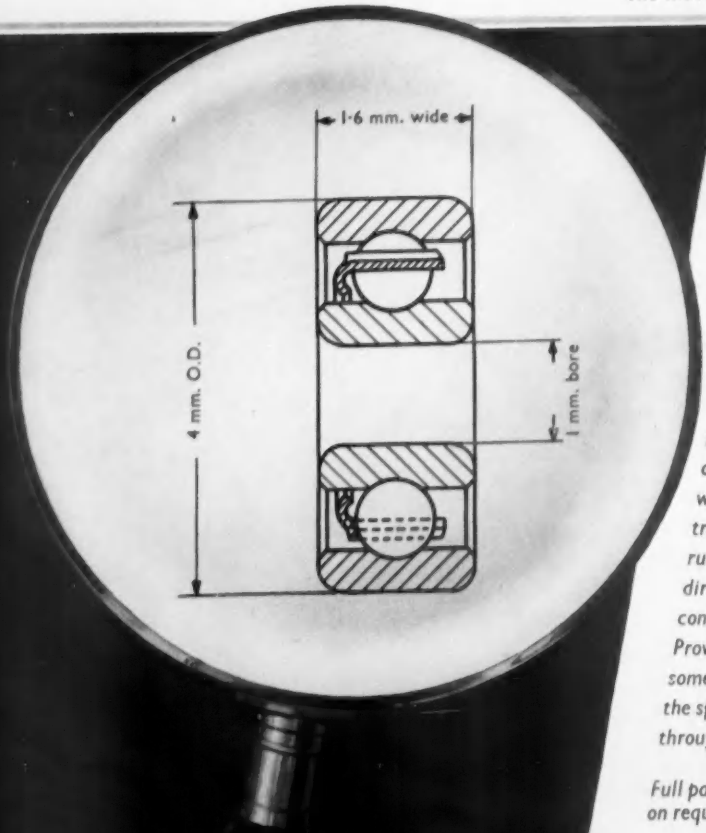

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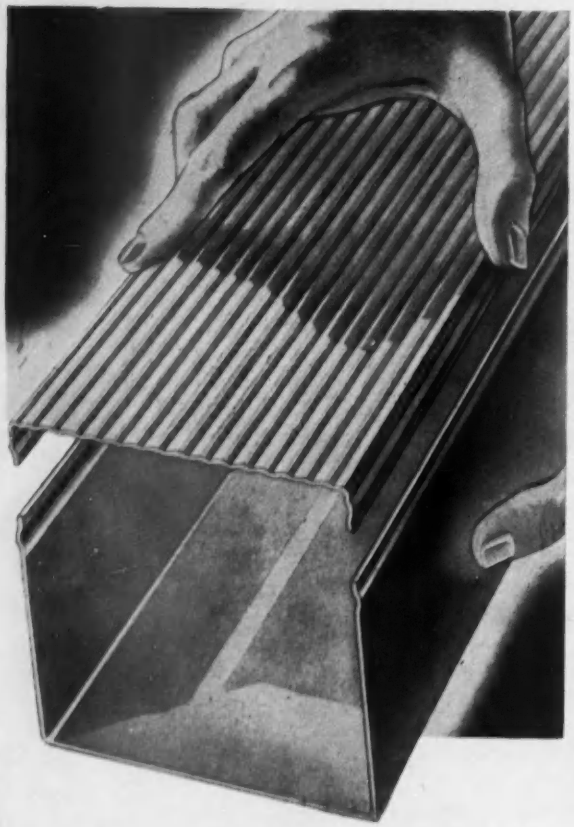

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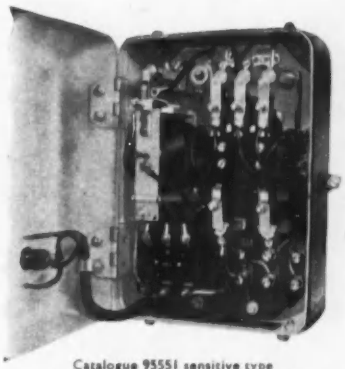
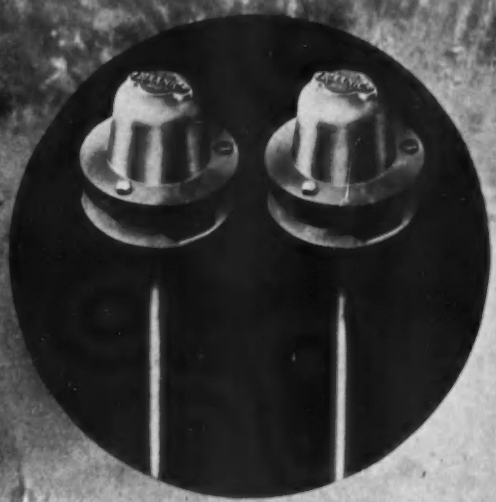


Catalogue 95551 sensitive type DIPSTICK water level control relay

DIPSTICK WATER LEVEL CONTROL



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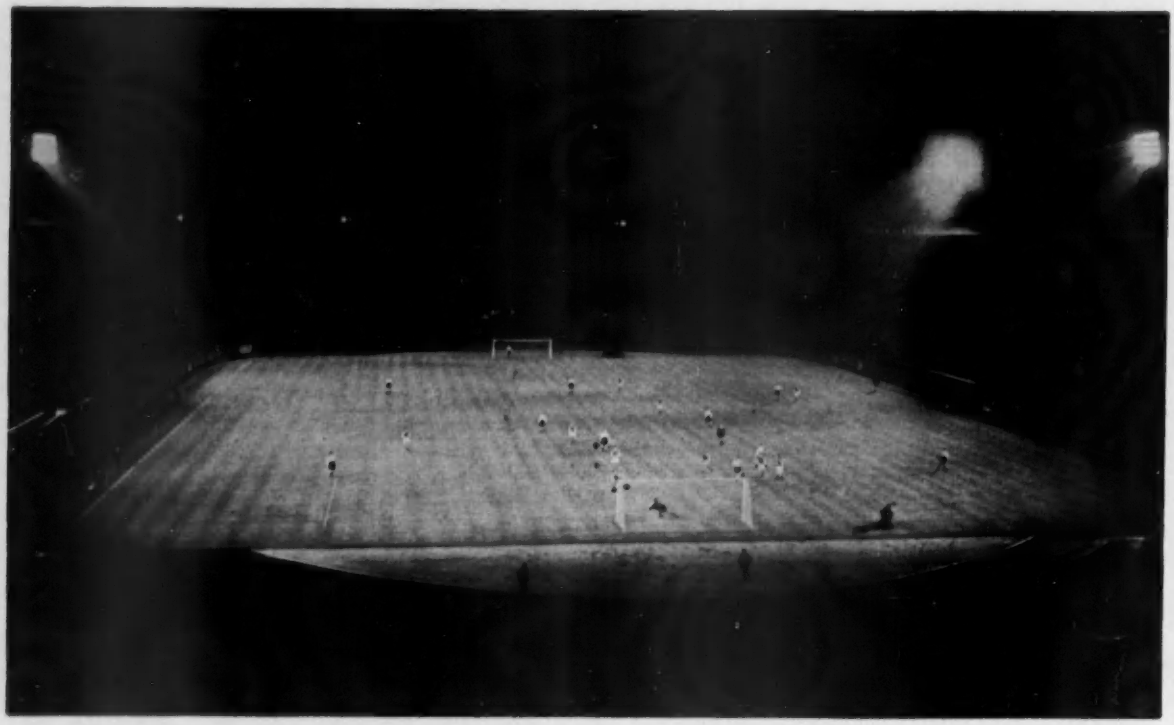

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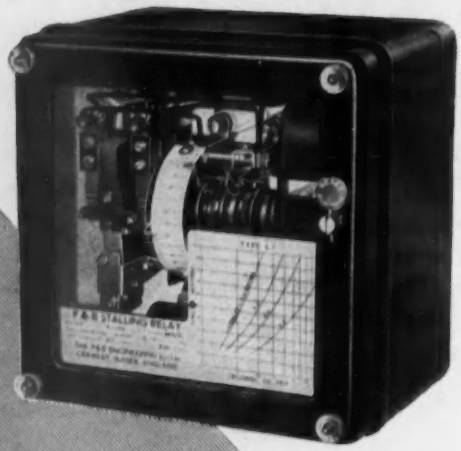

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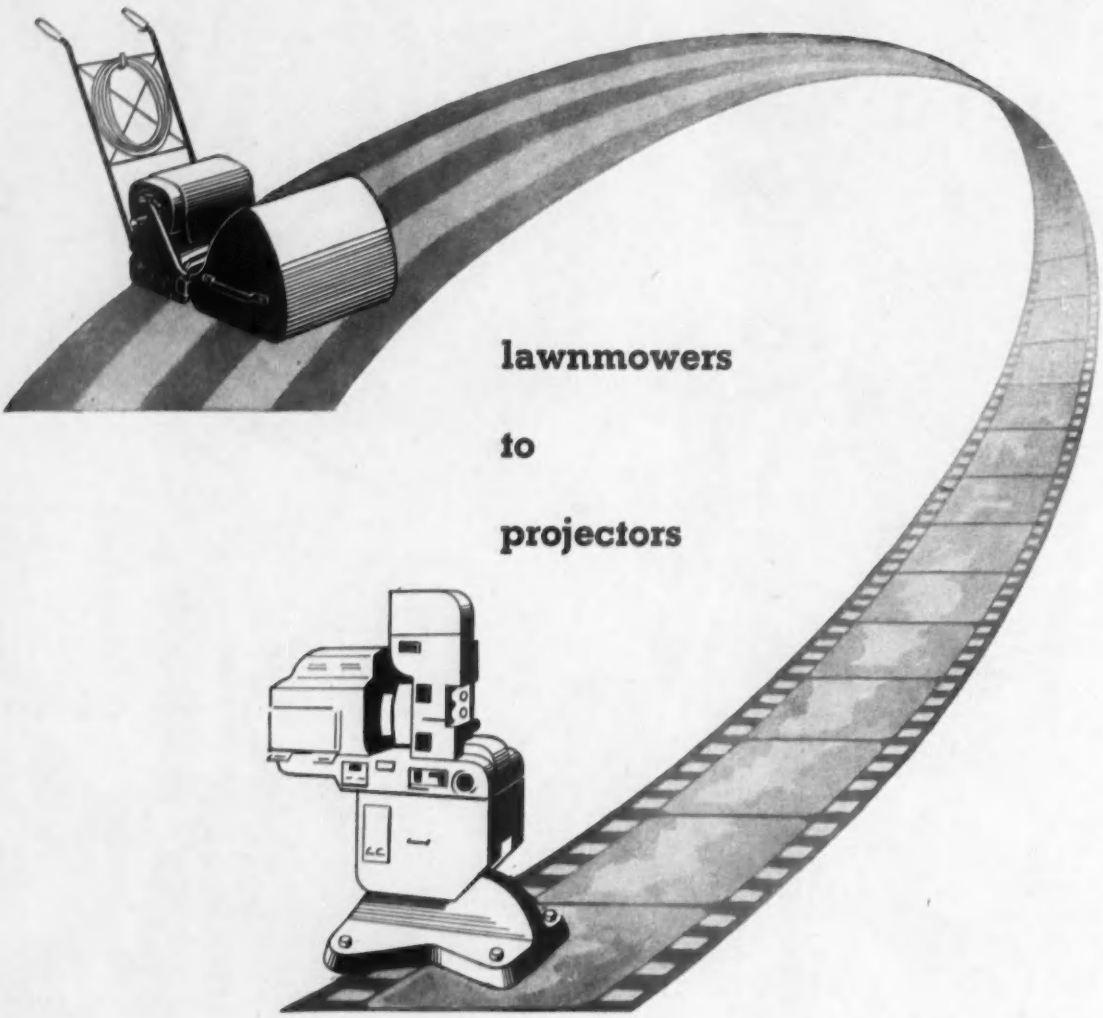

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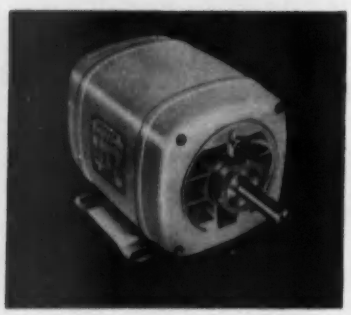

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ELECTRICAL TIMES

THURSDAY, 8 DECEMBER, 1955
Volume No. 128 Number 3344
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OPTIMISM ON NUCLEAR POWER

It has become a commonplace that Great Britain must achieve early success in nuclear power generation in order to offset the growing failure of coal supplies to measure up to the country's power requirements. The White Paper on nuclear energy published last February made it clear that the electricity authorities would have the task of turning policy in this field into reality, and the attitude of the C.E.A. and industry to this task was brought out during the impressive inaugural meeting of the British Nuclear Energy Conference held last week. Outstanding amongst the lectures presented was that in which Mr V. A. Pask and Mr J. C. Duckworth of the C.E.A. worked from an estimate of the country's requirements for electricity and its probable resources in available coal, to conclude that the rate of nuclear power station commissioning called for in the White Paper will need to be doubled; that by 1980, the country must attempt to have 23,000 MW of nuclear generating plant in operation. This is indeed a bold conception, and one that raises the query whether British industry, only recently integrated closely with the nuclear power programme, will be able to meet such demands. This question received consideration in the discussion of the lecture, and a certain amount of doubt was apparent, though manufacturers were cautiously optimistic. This call for a double dose of nuclear power stations must obviously be carefully considered. The bright spot in the situation is the increasing optimism apparent concerning the relative cost of nuclear generated energy; some reduction on coal-based costs seems increasingly likely of achievement, even with the earliest nuclear power stations.

RECRUITING FOR INDUSTRY

Engineering education was again in the news last week with announcements affecting the two main sources of recruitment for professional engineers, the universities and the larger technical colleges. In one respect at least the two announcements are complementary. The report which the Committee on Scientific Manpower has issued gives special attention to the fear expressed by a number of engineering firms that the extension in university training of engineers is attracting away talent that might more effectively enter industry through student apprentice schemes and the like. This idea the Committee rejects, largely on the grounds that even with this expanded stream of university students in technology, industry cannot get the number of graduates it requires. As one result of its investigations, however,

the Committee does stress the failure of engineering to attract its fair share of the best of school leavers; recruitment by all routes must be increased both in numbers and in quality. To achieve this, the status of the professional engineer must be raised, and some hope of this is involved in the announcement that the National Council for Awards in Technology has been set up at last. The engineering institutions for various good reasons long fought the principles on which this new body has been established, but now they have decided that treatment of some kind for the patient is more important than complete agreement between the doctors, and are co-operating in every way to give the scheme a fair trial. One of the early matters which the new Council will have to decide is the title to be given to its award, which will do much to determine the status in the public eye of those who enter engineering through part-time study, and is in this way likely to influence recruiting.

TIDINESS IN SCOTTISH SUPPLY

A wide-sweeping simplification of the mass of largely unrelated local legislation which the developing supply industry scattered in its wake is proposed by the South of Scotland E.B. Consolidation of some two hundred local enactments into one is the aim of the Board, and it has begun the legal processes necessary to attain this end. Yet although in the main this step will leave unchanged the law in relation to electricity supply in Scotland, this is not wholly true. Provisions on a number of matters affecting consumers will be made uniform throughout the area under the new proposals, so although no completely new requirements and powers will be introduced, some may be extended in scope. The effect that this may have is apparent when it is noted that one part of the proposed consolidating order covers such subjects as extension of the right of entry into consumers' premises beyond the powers given in the Electric Lighting Acts, and the definition of the use of discs and altered coins in slot meters, and of interference with meter seals, as specific offences punishable by fines. While the general intention of tidying up the law will be generally welcomed, these generalisations of matters on which minor local differences existed may come under close scrutiny.

NEW ZEALAND GAS TROUBLES

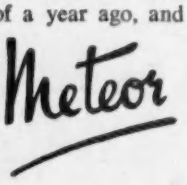
New Zealand electricity undertakings are showing a mixed response to a government proposal announced recently, that they should be made responsible for the taking over and operation of "essential" gasworks. Included in these proposals is a requirement that the electricity undertaking in the area in which an "essential" gasworks is situated, shall begin operation within three months after receipt of notice that the works has been declared essential, irrespective of any negotiations which may be in hand. It is remarkable in view of the size of the commitment involved—gas at the moment makes up some 13% of New Zealand's heat and power supply—that electric power authorities were not called in at an early stage, when the proposals were being formulated. Opposition to the scheme appears to be mainly founded on the belief that amalgamation of the two power sources, with a certain amount of government control by committee, is a step toward facilitating nationalisation of the fuel and power industry. At the same time there is a strongly held belief that electricity undertakings, under the requirement for equating charges for gas and electricity, will have to subsidise the gas consumers to the extent of about £1m per annum. The government, however, insists that the gas industry must be prevented from going into bankruptcy as, although its capital valuation is only £7m, it would require at least £25m for the necessary electrical plant to replace it. Although the broad basis of the argument is thus clear, the details involved in such a transfer raise many difficult problems for the electricity undertakings.

SAFETY AND CINEMAS

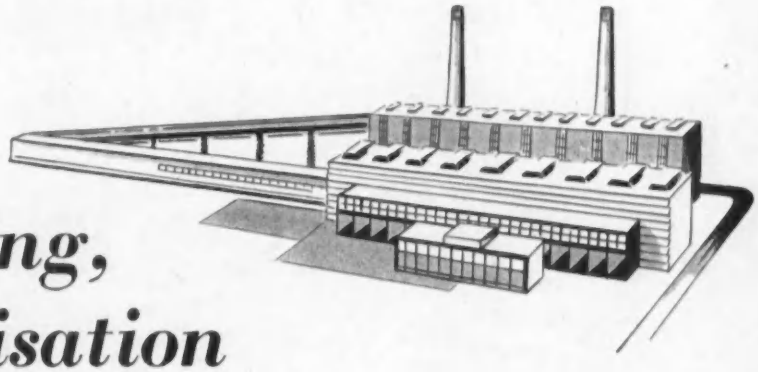
The Code of Practice covering maintained lighting in cinemas and mentioned in our article on the same subject last week has now become generally available. This code, as was anticipated in the article, goes into considerable detail as to the factors involved in cinema lighting, especially with respect to the provision of safety lighting. It thus supplements the Cinematograph (Safety) Regulations in this particular field. Of concern to electrical contractors is the requirement for periodic testing of electrical installations. As far as the safety lighting system is concerned, the battery must, according to the Regulations, have its capacity tested at least once every six months and the test results recorded. The testing of the practical efficiency of the safety lighting is dealt with in the Code of Practice. Scattered observers in the auditorium are required to be able to find their way safely to the nearest exit after a period of not more than ten seconds to allow for visual adaptation from normal to safety lighting. These tests are in addition to a yearly examination which must be carried out on protective arrangements in the main electrical installation. Fulfilment of these requirements needs outside specialised knowledge and here the electrical contractor can profitably offer his services.

DOUBLE TASK FOR MANUFACTURERS

Advertising by the electricity supply industry was questioned in the House of Commons last week when that indefatigable opponent of domestic electricity, Mr Gerald Nabarro, sought to persuade the Minister of Fuel to extend his present restrictions on promotional advertising to a complete prohibition. He failed completely, but his question brings a reminder of the difficulties at present hampering the industry's appeal to the public's purse at a time when advertising generally is expanding fast. Yet if direct advertising by E.D.A. and the area boards is being pegged back at this time of increasing competition, there is at least some reassurance in the way manufacturers are keeping the advantages of domestic electrical appliances before the public. Their advertising effort in recent months has been running at more than double that of a year ago, and although it does not attempt to sell electricity against gas or coal, it must have some effect in that direction. To this extent it ensures that the case for expanding the use of electricity does not go by default.



BUILDING A POWER STATION PART THREE



Contracting, Site Utilisation and Progressing

PERFECTION in planning would ensure that prior to the first contractor arriving on site, the power station would have been completely designed and contracts successively placed to cover the final scheme down to the last nut, bolt and washer. Such perfection, however, is virtually impossible of attainment under present circumstances. It implies a large design and construction staff, delivery on schedule by manufacturers, avoidance of legal or political hold-up and availability on site of the necessary skilled and unskilled labour. Due, however, to increasing rationalisation the situation is rapidly improving, in some aspects, as the post-war backlog is being overtaken and manufacturing capacity is being enlarged.

Readers of our previous articles published in our issues of 6th January and 24th March will have realised the complications which arise in the obtaining of sites and the establishment of optimum set sizes and steam conditions. In those articles it was shown that the principal difficulties lay in the relationship between the Central Electricity Authority and public or local bodies. The co-ordination between the C.E.A. and the manufacturers of electrical and allied plant is, however, of equal importance. This contact is primarily, from the C.E.A. aspect, divided into three parts: the first financial; the second the relationship between contractors and Division or consulting engineers; and the third progressing and organising production in order to ensure the optimum use of production capacity, elimination of bottlenecks and establishment of suitable priorities where they are necessary, bearing in mind the overall picture of the country as a whole.

Contracts

For the purpose of this article it is not proposed to go deeply into the general financing of the C.E.A. organisation. The development of the present system of contracting is, however, of importance in connection with planning. Prior to nationalisation, there existed a great diversity in the manner and in the terms and conditions under which contracts were offered and accepted. It was immediately obvious that a continuation of local methods would lead to administrative chaos within the new regime. An early step was to establish a common system which would be fair and reasonable, both to the manufacturers and the nationalised industry, and also to agree to terms and conditions for general use in connection with contracts executed for the nationalised industry as an employer. To perform this work a number of joint committees were set up on which sat representatives of the manufacturers, of the then fourteen Area Boards and of the Central Authority.

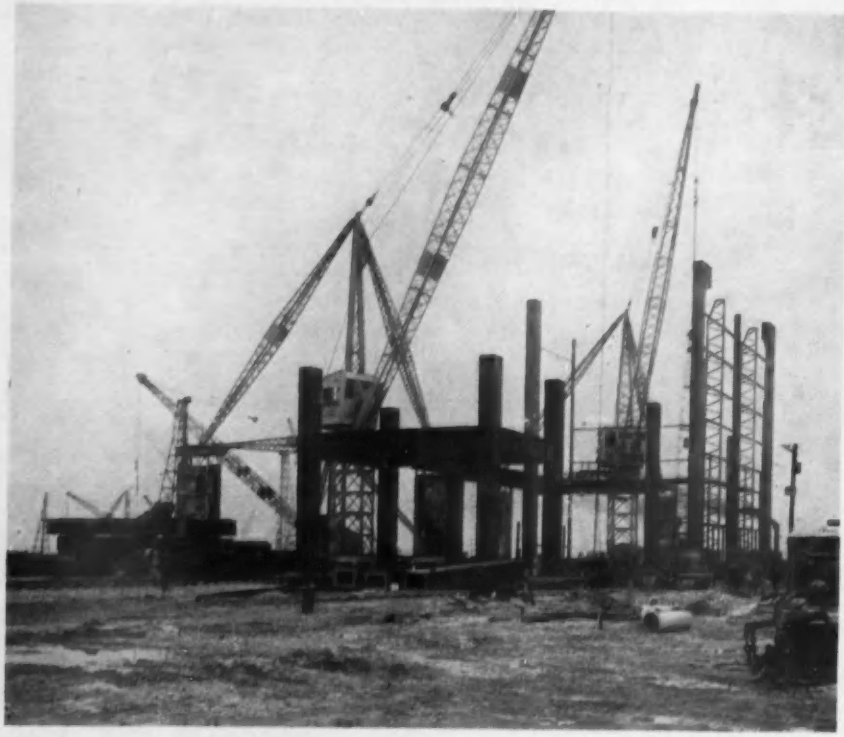
A Contracts Department, which is the smallest of the Headquarters Departments was established. Close collaboration exists between the Chief Engineer and the Chief Contracts Officer particularly with regard to general terms and conditions, price levels and other relevant factors. The powers to make contracts delegated by the Authority to these officers are wide. The Contracts Department, however, has no responsibility whatsoever for expenditure incurred by the area boards.

The work carried out by the Department involves negotiations with the building, civil engineering and constructional steelwork, contractors and with the numerous main plant contractors concerning the conditions under which contracts are let and with price levels generally.

Specifications for standard plant items are prepared by the Chief Engineer's Department and those for the remaining plant contracts are provided by the division or the consulting engineers, depending on who is responsible for the station design and construction. These specifications, with invitation to tender, are issued by the divisions or consulting engineers to firms whose names have in the first instance been put forward by the division in whose area the power station is to be located. For the building of one power station over forty main contracts with attendant sub-contracts may be necessary.

Contract Values

Up to £5,000 the Divisional Controller can place a contract himself. Over £5,000 the contract is placed by a panel consisting of the Divisional Controller and two or three officers of the division, with the proviso that the contract should be granted for the lowest competitive tender, should be within an estimate approved by the Authority, and under £100,000. Between £100,000 and £250,000 approval must be given at Headquarters by the Chief



The first section of the steelwork being erected on site. At the bottom right hand corner is one of the substations

Engineer and the Contracts Officer, and over £250,000 the responsibility devolves on the Technical Developments and Contracts Committee. An exception to this procedure is the North West, Merseyside and North Wales Division where the Committee of Management can place contracts for sums not exceeding £500,000.

The terms and conditions on which the Authority wishes to enter into the contract are included with the specification and invitation to tender. These clauses cover such points as responsibility for transport, access roads, site availability, variation in wages rates and so on. For such items as boilers, turbo-alternators, large transformers, high-voltage switchgear and other major items, the number of firms capable of producing the plant is very limited, and the recommendation of the division concerned is subject to the advice of the Chief Engineer's Department in collaboration with the Contracts Department.

There are many contractors known to the Authority who will submit tenders on a truly competitive basis. A choice of a reasonable number of these firms is made, with particular regard to site location, any unusual technical requirements, known commitments and past experience. Providing the tender complies with the specifications and the standard conditions, the job generally goes, in the absence of some quite unusual feature, to the lowest tenderer.

Conditions and Terms

As a result of the initial discussions of the joint committees of the Authority, the divisions, the manufacturers and the area boards, standard terms and conditions of contract were evolved covering all the main fields in which the Authority places contracts for capital goods. These conditions are based on the "model conditions" prepared by the various Professional Institutions. They are considerably detailed, and among other things cover the nature of the security which the contractor must give by way of guarantee, the terms under which the Authority will provide gas, electricity and water on site; provisions for dealing with unexpected difficulties which may be encountered in execution of the contract; nature of tests and inspections to be made; times and circumstances of progress payments by the Authority to the contractors; acceptance dates of plant items by the Authority; wages and conditions of employment of workmen; and liability for accident.

A further type of negotiation arise in connection with the acceptance of tenders. This is when all tenders are valued at the same price or when only one firm is available to tender. The duty then devolves on the Contracts Department of ensuring that the price is reasonable by comparison with previous experience of price or with the cost of similar work being undertaken by other firms. Should the tender be considered too high, consultations are opened with the Chief Engineer's Department, the division or the consulting engineers, and although this procedure needs a great deal of time, effort and patience, it has been instrumental in saving the Authority considerable sums of money.

Site Utilisation

In our previous article the considerations affecting the selection and the obtaining of a suitable site were dealt with. Before, however, consent to build can be obtained, a plan of the proposed station in broad outline must be available. Considerable preliminary work, however, needs to be carried out even before even this plan can be presented. First a complete survey of the subsoil, and in the case of power stations sited on rivers and estuaries, of the water conditions is required. These surveys have two main objects: the first is to ensure that if the subsoil varies over the site the completed station will be located with the best ground conditions; the second is to establish the effects on the estuary or river of the circulating water system. These effects can be of several types—erosion or silting of channels, alteration of the water flow due to civil engineering works, recirculation of cooling water at particular stages of the tide or under various conditions of river flow, temperature rise of the general mass of water and other factors. The quantity and temperature rise of the circulating water is fundamentally a function of the size of the proposed station, and it is, therefore, possible to establish these at an early stage. In the Marchwood case, two independent surveys were carried out, one by the Southern Division and the other by the Civil Engineering Consultants, Sir William Halcrow and Partners, who are responsible for the constructional work. Even at this early

stage it is necessary to go into considerable detail. Factors which can affect the location of the station on the site are the direction in which the transmission lines take off, the position of rail and road access, and the aesthetic appearance of the station viewed from various vantage points in the neighbourhood. When the relative values of these items have been considered, the location of the station can then generally be laid down.

The layout of the buildings was, in the Marchwood case, largely determined by the division. A factor here was whether it was cheaper to build the wharf close to the original shore and the area selected for the station (a procedure which would have involved considerable dredging costs) or to install a coal conveyor system to transfer the fuel from a remoter jetty to the station site over a considerable distance. In the event, it was decided to compromise with the result as shown in the plan drawing shown on the next page.

Another factor of importance to station location is the culvert layout. The sizes of the culverts are fixed by the capacity of the station, and at Marchwood were the responsibility of the division. Here again economic considerations entered the case and again availability of materials had to be taken into account. For example, the original proposal to use cast iron had to be amended and reinforced concrete construction substituted.

With the location, orientation and general arrangement of the station established, work can begin on the civil engineering side, although it is not possible to develop the civil engineering details until the mechanical design is fairly well advanced. The positions of the heavy loads in the station must be laid down, the layout of the culverts, the internal arrangement of stanchions, the position of the boilers, the crane size (which determines the turbine house stanchion sizes) and other details must all be available to the civil engineering contractor before he starts work. A point which can cause considerable trouble here is the location of water tanks, which in some cases have to be at a specific height.

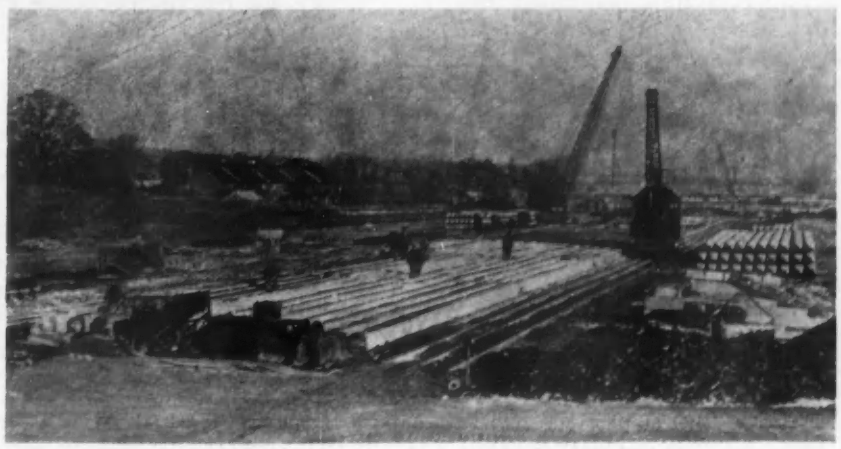
Establishing Dimensions

Much of this work is, of course, founded on past experience, and with the data available to the division or consulting engineers the main dimensions and arrangement can be fixed without fear of error. In the main building construction the technique is to erect the stanchions on a modulus—this being effectively the highest common factor of the spacing between the stanchion centres. At Marchwood the stanchion spacing was controlled by the longitudinal distance within which a unit of plant could be fitted. This was chosen as 65 ft, but that was too wide a gap to span economically, and the boiler drum would in any case have needed closer spaced supports. Using a 39 ft and a 26 ft spacing alternatively gave an arrangement which obviated the rotor withdrawal space coinciding with a stanchion, and also suited the boiler arrangement: 13 ft was, therefore, the modulus for design purposes.

The height of the turbine house is settled by the lift required to transport the deepest part of the machine, usually the alternator stator, over the top of other units. Boiler house height is, of course, dictated by the boiler maker. Modern large boilers are slung from the structural steelwork and drum height, therefore, controls boiler house structures.

In the original Marchwood design it was envisaged that the sets to be installed would be of one type of manufacture with stators weighting 160 tons. The crane was consequently designed for this load, and the turbine house stanchions calculated on the basis of building load, crane weight and stator weight. A change of plans at a later stage had to be made due to manufacturing difficulties. Another manufacturer was approached for the machines and in this case the weight of the stators was considerably less at 120 tons. Extensive changes in foundations block design were also required to accommodate the new sets. The lateness of the change, however, was such that the crane and stanchions were well advanced and could not be altered. This illustrates the difficulties that can arise in station design through circumstances out of the direct control of the division or consulting engineers, and which

Some idea of the site area required is provided in this illustration (above) of the concrete batching plant.



The adjoining photograph on the right shows the pile casting area. This was located on land to the west of the area allocated for the outdoor substation

require much work and ingenuity on the part of all concerned if an economic and technically satisfactory answer is to be found.

Preparing for Contractors

Once the main buildings have been placed on paper and approved the requirements of the contractors coming to the site must be considered. Initially space must be allocated for the use of the civil engineering contractors who will require to erect concrete mixing and batching plant, may require a pile casting area, and will need storage space for reinforcing rods, shuttering pipework, vehicles and other equipment. They will also need to erect offices and workshops, and will require water, telephones and probably power supplies.

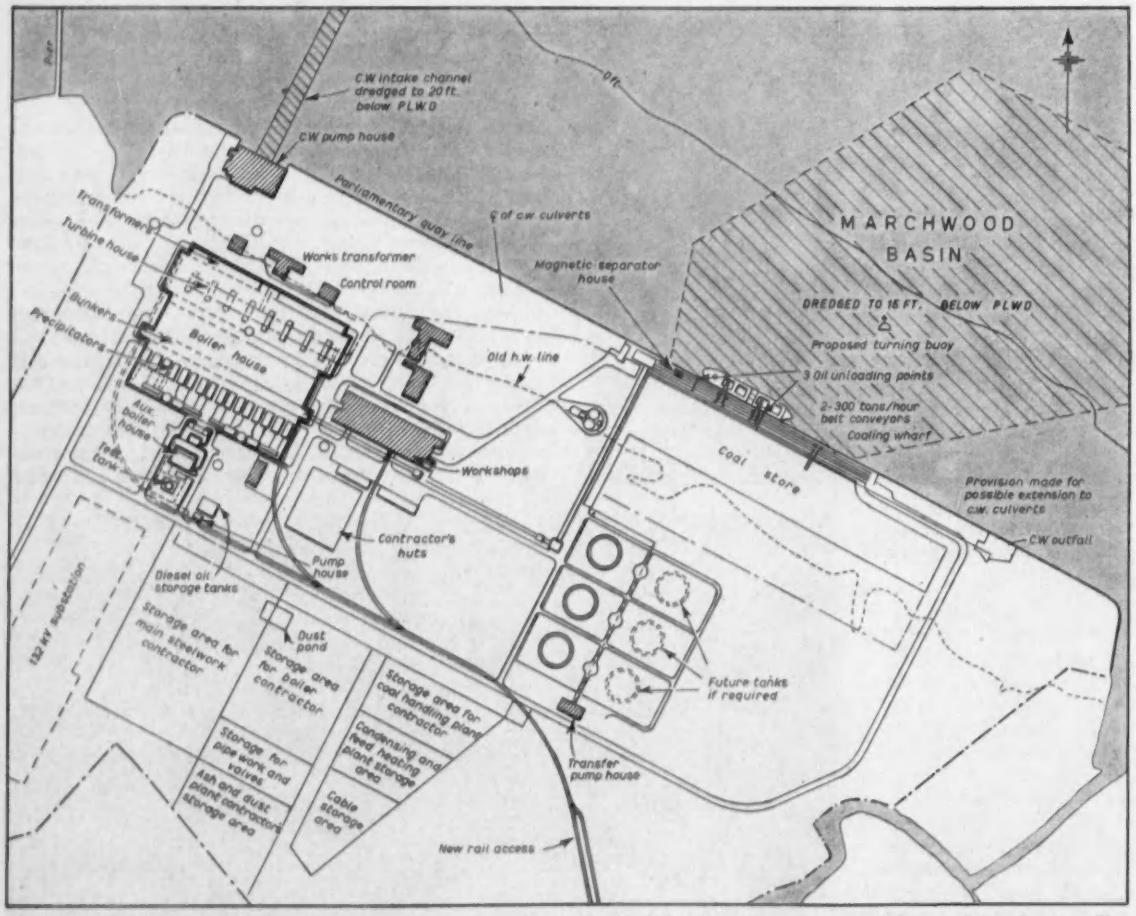
The steel erector follows the civil engineering contractors, and his requirements are that the storage area should be as near the station site as possible, and should have a rail siding running into it. Consideration in the siding layout should be given to the length of the loads coming in as many of these will be carried on special bogies or trucks. The ground in the steel storage area should possess good bearing qualities as cranes will be required to undertake heavy lifting work. If spur lines can be run into the actual working site from the siding, the work of the steel erector can be much eased. This was carried out at Marchwood, the spur line being moved to different positions as the work progressed. The main object to be aimed at is to avoid any double-handling of structural steel: if at all possible there should be a minimum of waiting time, and girders or stanchions arriving on site should go straight into their positions and be erected.

It is particularly important that this question should be carefully considered in the early stages, as the contract with the steel erector usually states that reasonable facilities will be provided, and if there is delay or difficulty, the Authority may be confronted with a claim for double-handling. The contesting of such claims is not an easy matter as the definition of "reasonable facilities" is necessarily liable to varying interpretations.

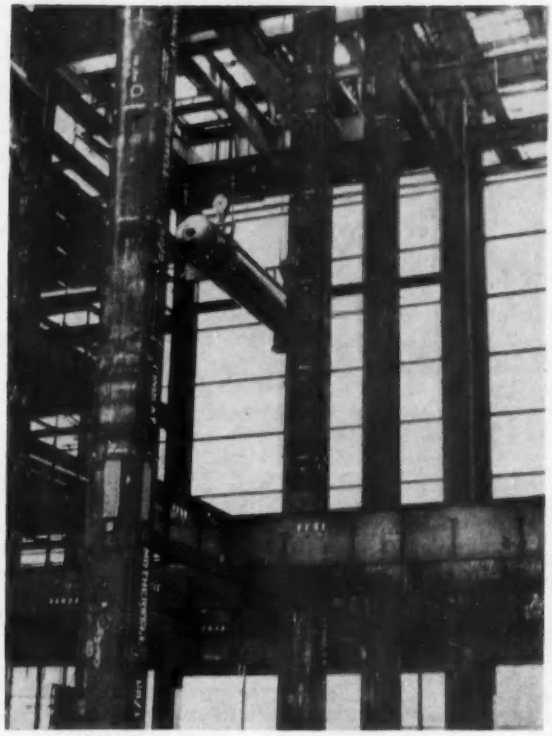
The boiler contractor will require an area with facilities similar to those provided for the main steelwork contractor, although in this case the lift required will generally be lighter. Other storage areas will be needed for pipework and valves, ash and dust plant, coal-handling plant, condensing and feed-heating plant, and cables.

Experience has shown that much time and labour and damage to small equipment can be saved if priority is given to the erection of the workshop and stores buildings. The workshop should be equipped with the necessary plant for welding, turning, facing, pipe bending and other tasks required on site. The machine tools and equipment can be used by contractors, but supervision should be provided by a station fitter, employed at an early stage.

If it can be arranged that small incoming items belonging to contractors not yet on site be taken on charge by



This detailed plan of the site indicates the extent of land reclamations involved and also shows the arrangement of some contractors' areas. The small circles indicate the location of the substations for powering the contractors' machines



The first of the boiler drums is being lifted into position

the storekeeper (another early employee) and issued to the contractors as required, much confusion can be avoided. In many areas, the necessity of building a hutted camp to house the employees of the contractors may need to be taken into account. These camps, which are of a temporary nature, may often be located outside the power station site.

The question of providing auxiliary services also needs to be considered at the outset. The modern trend is to use electrically - powered equipment if possible for the majority of the equipment on site, and it is not always realised how great the demand can be. The power is, of course, obtained from the local electricity board who will establish a metering point and charge the Central Authority accordingly.

It was decided at Marchwood, to lay down a system at 11 kV feeding an average number of six substations. The capacity varied from 200 to 500 kVA. The substation arrangement, being temporary, was of the simplest with all protection operating on the 11 kV side of the 11/·415 kV transformers. At peak working the maximum load drawn from this system was in the region of 1,200 kVA. The only units on site not powered by electricity were the double-acting sheet-steel pile drivers. All other main drives were electric. It must not, however, be thought that the figure of 1,200 kVA is representative. As has been mentioned in the previous articles, the driving of the piles on the Marchwood site was particularly difficult and recourse was made to water jetting at the pile tip to prevent compacting of the soil. These jets were supplied through temporary pipes to the pile frames and the pumping load alone was in the region of 200 kW. In other sites, with better subsoil conditions the maximum demand might, therefore, be considerably less.

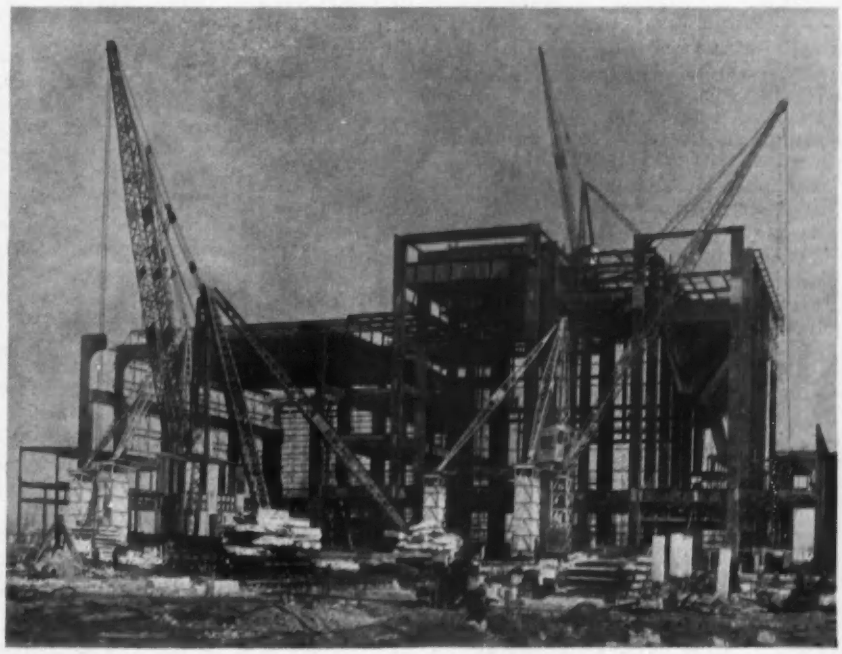
Sewage disposal also presents some difficulty. In some areas it is possible to utilise the existing sewage system, but in many cases, provision must be made on site for the necessary treatment plant settling tanks and ancillary plant.

Finally, work must be done to ensure that there are adequate fuel storage and, if practicable, ash disposal sites within reasonable distance of the station and that the road and rail facilities are ample.

Inspection and Test

There are eleven divisions of the Central Electricity Authority, in addition to the South of Scotland Board, the North of Scotland Hydro-Electric Board, and private users, and undertakings abroad, all competing for generating plant. Within the C.E.A. at 31st March of this year, 31 new power stations, 7 new sections and 40 extensions of power stations with a total installed capacity of 11,730 MW were under construction or planned in the plant programmes to the end of 1960. Such a programme requires close co-ordination, both to ensure that the maximum output is obtained from the manufacturer's works and to guarantee that the individual station sites and extensions are supplied with the right equipment at the appropriate time to allow work to proceed with the greatest smoothness and efficiency.

The overall plans are handled by the Generating Station



Progress on the steelwork is going well ahead in this view which shows the irregular spacing of the boiler and turbine bay stanchions

Construction Branch at Headquarters, which co-ordinates the progress of the work on the various stations from a national viewpoint. The divisional engineers are, however, responsible for work on site, while Headquarters deals with progress in the manufacturers' works. These duties are taken over by the Production, Inspection and Test section (P.I.T.) of the Generating Station Construction Branch. This section was established in 1949 and has regional offices at London, Birmingham, Derby, Leeds, Manchester, Newcastle upon Tyne and Glasgow. The principal reason for the establishment of the section was to avoid the chaos which could develop if each of the divisions was engaged in doing its own chasing, often in competition with other divisions, and trying to establish its own priorities.

At the time of its formation the section had to contend with considerable difficulties, caused by shortage of manufacturing capacity and restricted raw material supplies. The primary duty of the section is, however, to expedite the erecting and commissioning of plant. The unavailability of new plant, with its high capital cost and high efficiency, means a substantial loss to the Authority during every day of delay in commissioning, and the task of this section is, therefore, most important.

The authority of P.I.T. at a manufacturer's works is limited to C.E.A. orders only, and no interference can be made in orders for export or other customers.

It is naturally important that where main contractors are concerned the P.I.T. section should be able to aid in the delivery of bought out and sub-contracted items, and to this end copies of all orders placed by manufacturers in connection with C.E.A. plant are submitted to headquarters.

The relations between P.I.T. and the divisions must be particularly close, as a certain amount of co-ordination must be handled by the divisional or consulting engineers on site. It is not practicable for progressing and design improvement to be divorced, and as far as design of the station as a whole is concerned, the division holds the responsibility. Besides acting on special divisional requests, the P.I.T. section produces a general monthly report to the division on the progress of the main items of plant at the works.

Main plant co-ordination meetings are also held between P.I.T., the British Electrical and Allied Manufacturers Association and the Water Tube Boilers Manufacturers Association, and weekly meetings are held by the P.I.T. staff to eliminate bottlenecks and to clear local troubles.

The staff of the section are particularly careful not to disclose the techniques and development of one manufacturer to any competing firm, and it is emphasised that their job is to serve both the manufacturer and the community.

Close liaison is also maintained between P.I.T. and the British Transport Commission to arrange for the use of the special road and rail vehicles at the appropriate times for the transport of the large and heavy loads associated with power station construction.

(to be continued)

Thermistors in Low Frequency Control Circuits

STABILISING control systems operating on very low frequencies can present considerable difficulty since components reactive at power frequencies cease to have appreciable effect below a few cycles/sec. At such frequencies, however, temperature sensitive resistors having appreciable thermal time constants assume considerable value as a means to obtain phase shifts of electrical signals, and useful time constants can be attained. Recent investigation and development of circuits employing thermistors as phase shifting elements described in a paper read last week to the I.E.E. Measurements and Control Section by C. J. N. Candy, PH.D., GRAD.I.E.E., has shown that, under certain conditions, greatly increased time constants are realisable, whilst a simple method of specifying the properties of such circuits has also been derived.

Thermistors are made in a variety of forms, and the type A1522/100 (S.T.C.) was chosen as the subject of the experiment. This comprises a small bead of the semi-conducting material fused to two fine terminal wires and mounted in an evacuated glass capsule, thus reducing heat losses to a minimum. In common with all thermistors, its electrical resistance varies over a wide range with temperature, and it possesses a relatively large negative temperature coefficient.

The static current/voltage characteristic is such that, when currents too small to heat the thermistor appreciably are passed through it, a voltage develops across it as determined by Ohm's law. However, as the current increases, the power dissipated causes the resistance to fall, and the voltage across it rises to a hump and then falls approximately exponentially with increasing current. It is trus necessary to operate the thermistor in series with a suitable resistor, whose resistance is such that the thermistor is biased over the hump.

If, however, the current through the thermistor is continuously varied, the voltage across it will depend, to some extent, on the rate of change of current because the temperature of the thermistor, and consequently the voltage across, lag behind the changes in power. Were a large alternating current to be passed through the thermistor, therefore, the voltage established across it would lag in phase, but as a result of the shape of the characteristic, considerable harmonic distortion also occurs.

For this reason, the thermistor is polarised with a steady current on which is superimposed a small variable current. By this means appreciable change of resistance can occur, thus causing a variable voltage to be developed as a result of the polarising current passing through this changing resistance, in addition to that due to the variable current. Analysis shows that the thermistor may thus be represented by an equivalent circuit having a semicircular impedance locus, whilst distortion is small provided that the alternating current is less than 25% of the polarising current.

An illustration of the use of thermistors in this way shows them employed in a simple phase-shift network, to impart a high time constant which makes such networks eminently suitable for stabilising many automatic control systems where the frequencies are low. Typical examples of this kind of system are the steering of ships and aircraft, and circuits such as the temperature control of ovens or the stabilisation of supply voltages, where thermistors are already being used as measuring elements. Moreover, the thermistor may be polarised with an alternating current at 50 c/s and a signal current in the form of a 50 c/s modulated carrier applied.

A further paper, describing a vector notation for amplitude modulated alternating quantities, was also read by Mr Candy. The notation enables vector expressions to be derived for impedances, admittances, and transfer ratios of circuits, these expressions operating, in turn, directly on the vector for the modulated voltages and currents.

Analogue Computer *for Guided Missiles*

"TRIDAC" AT R.A.E. HAS 600 KW PEAK LOAD

THE problems associated with guided-weapon flight and performance are exceedingly complex, and the verification of computations, made to solve these problems, by the firing and course-plotting of such missiles is expensive. The use of a large computing machine is one method, however, whereby the mathematical drudgery can be minimised and considerable saving made in the number of firings required. Such a machine is "Tridac" (the tri-dimensional analogue computer) now installed at the Royal Aircraft Establishment, Farnborough. This machine was described last week by Lt-Comdr F. R. J. Spearman, R.N., Mr J. J. Gait, Mr A. V. Hemingway and Mr R. W. Hynes at an ordinary meeting of the I.E.E.

Design Principles

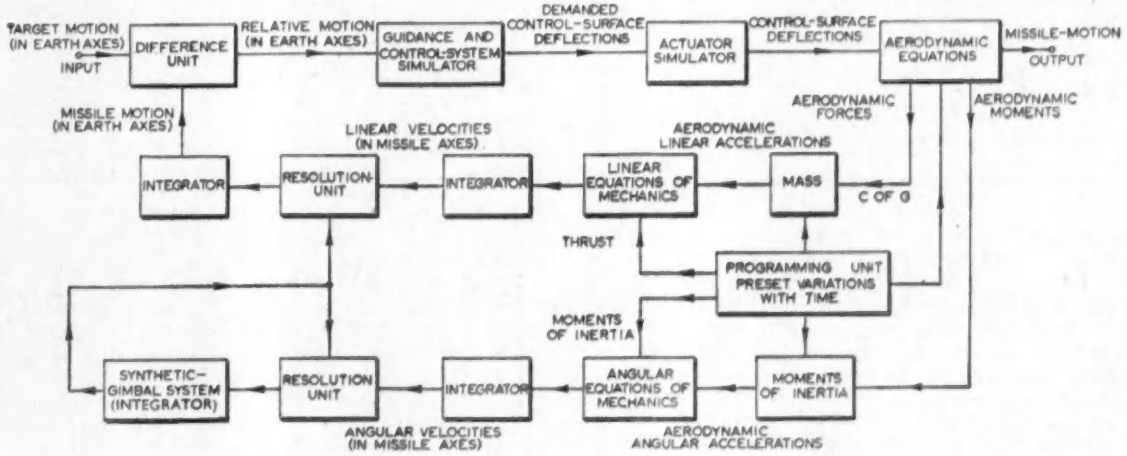
In the design of the machine it was accepted that a time scale of 1:1 should be accepted which would have the advantage of permitting actual working sections of the missile under investigation to be included within the computational arrangement. This, in turn, implied that due to time availability the computer should be of the analogue type. The direct voltage analogue principle was selected as offering greater promise of flexibility with adequate accuracy than mechanical, electromechanical or alternating-voltage analogue types. This decision made it necessary to develop low drift d.c. amplifiers with adequate long-term stability, a task which was successfully performed. Flexibility and ease of operation were also required and means to these ends were the introduction of patch panels for changing the computing circuits and potentiometers for the changing of constants and scale factors.

Application

The main application of "Tridac" was to the solution of the problem of a guided missile attacking a target in three-dimensional space, taking into account missile aerodynamics, target motion, auto-pilot characteristics, the nature of the guidance and control systems, and the kinematics of motion. The overall system had several inter-related feedback loops as, for example, the control-surface actuator and the guidance and the kinematic loops. The interacting forces and moments also required to be taken into account. The simulator was required to convert such quantities, computed relative to rotating and translating principal body axes of the missile, into quantities referred to fixed non-rotating ground axes or to other moving axes such as those of a radar reflector. For the particular problem of a missile attacking a target. "Tridac" was used as a closed loop system, with the target motion as the input and the missile motion as the output. The input could be represented by the target's Cartesian co-ordinates referred to the earth axes, and the quantity fed back could be the missile position similarly represented. The object of the guidance and control system and actuator simulators, working through the missile aerodynamics was to reduce to zero the error between input and feedback, and hence the input and output, within the time of flight of the missile.

There were, of course, numerous units which produced the various functions involved. The axis transformations were carried out by synthetic gimbal systems which simulated through four mechanically independent shafts the positions of the four gimbals (including a redundant gimbal to avoid "gimbal lock") which would hypothetically hold the missile. Other units computed angular accelerations, integrated them to angular velocities and converted them into gimbal angular velocity demands which were then fed into the hydraulic servo-mechanisms driving the gimbal shafts. These shafts had sine and cosine outputs which could be combined to produce the nine direction cosines required for the transformation from one system of 3 axes to another.

The paper continued by giving details of the unit arrangements and the computing methods and mathematical operations adopted. In most cases the problem variables were represented by voltages and each computing unit was arranged to have an operating output range of ±30 V. Integrator units consisted of standard d.c. amplifiers and drift correctors, with built-in capacitors and resistors to give the desired time-constants. Non-linear functions were



Schematic of "Tridac" connected as a closed loop system for testing guided missiles

in general generated by diode networks and were used in "Tridac" to simulate such effects as saturation and dead space, and to generate functions as $y=Kx^2$, $y=K/x$ and $y=K \sin x$. Squarer units producing $y=Kx^2$ were used for multiplication by the identity $(x+y)^2-(x-y)^2=4xy$.

Servo-mechanisms and associated electro-mechanical computing units were also extensively used. A difficulty here was to overcome the effects of inertia and therefore hydraulic means were employed.

The power consumption of the computer was 600 kW peak of which 200 kW was required for the electronic units and 400 kW for the hydraulic systems. Motor-generator sets were used to provide various a.c. and d.c. supplies, including the unstabilised h.t. supply. The frequency of the a.c. supply was checked against a crystal-controlled frequency divider, and h.t. supplies were stabilised locally in each raft. Valves in stabilisers, etc., were heated by a 50 c/s supply, but in computing amplifiers were heated by a d.c. supply derived by 3-phase rectification from a 400 c/s a.c. supply and stabilised by variable transformers which were servo-controlled by voltages fed back from the rafts.

In conclusion, it was mentioned that the cost of "Tridac" was about £750,000, but the cost of a similar production machine would probably be in the region of £250,000.

DISCUSSION

MR J. F. COALES (Cambridge University) said that the main reason for selecting an analogue system for "Tridac" was the problem of axis conversion. He thought that a flight table on which to test component parts was a necessity for guided weapons. No such table was available with "Tridac." MONS F. RAYMOND (France) described briefly a combined digital and analogue machine and MR W. R. THOMAS (Elliott Bros.) agreed that the accuracy of "Tridac" might well be improved by using a mixture of analogue and digital techniques, but where one wanted to get the "feel" of what was happening, one had to stick to the analogue. The relative merits of analogue and digital computers were also discussed by MR C. A. A. WASS (R.A.E.), MR E. G. C. BURT and MR L. E. MCALLISTER.

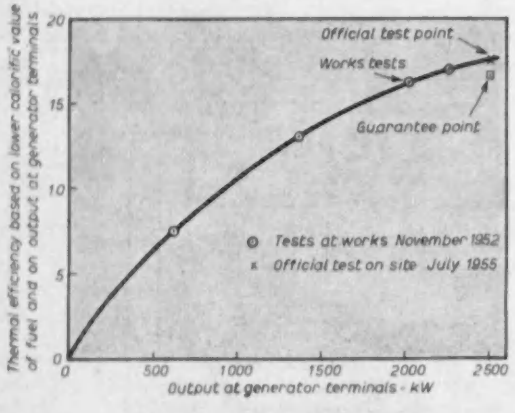
Test Results of a 2,500 kW Gas-Turbo-Generator

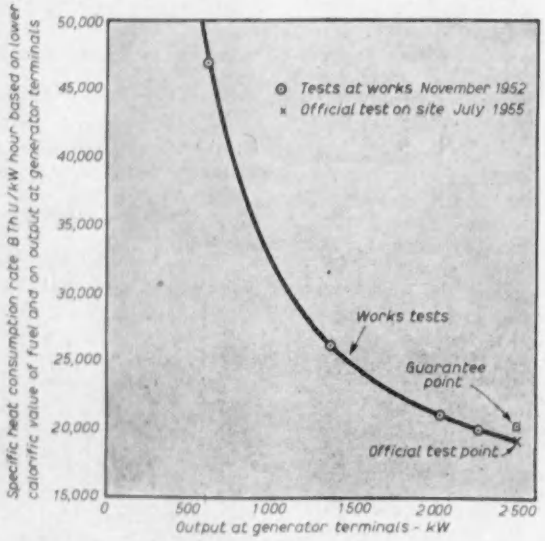
THE 2,500 kW Metropolitan-Vickers gas turbine-generator set supplied to the Metropolitan Water Board and erected in the Board's pumping station at Ashford Common, near Sunbury-on-Thames, Middlesex, had its official acceptance tests and consumption trials carried out on 6th July, 1955. This set, which was described in our issue of 7th July, will be used for peak-load and stand-by operation. It is a single-shaft open-cycle unit without heat exchanger and uses distillate fuel oil.

The terms of the guarantee given in the tender were that with an ambient temperature of 60°F and barometer of 30 in. Hg, an output of 2,500 kW would be obtained at the terminals with a heat consumption reckoned on the lower (or net) calorific value of fuel of 20,400 B.T.U./kWh; at the same time the exhaust gas temperature would not exceed 795°F. These conditions were met with comfortable margins.

The acceptance test consisted of a 6-hour run at the full load of 2,500 kW. This load was maintained with a variation of only a few kilowatts throughout the test by means of a load tank. The two-wattmeter method of measuring the load was used, and fuel consumption was measured by weigh tanks. The average observed heat consumption, based on the lower calorific value of the fuel and on output at generator terminals, was 19,364 B.T.U./kWh. This was 5·08% better than the guaranteed consumption of 20,400 B.T.U./kWh at full load. Applying agreed corrections for departure of atmospheric conditions from the standard, the corrected consumption is 19,345 B.T.U. kWh or 5·17% better than guarantee. Mechanical running of the set throughout the test was excellent. The fuel used was Class A diesel oil having a net calorific value of 18,305 B.T.U./lb.

Before being despatched from the Metropolitan-Vickers works the set ran for 90 hours on bench test. The performance results are shown in Figs. 1a and 1b. During these tests handling trials were carried out including load shedding tests. On suddenly shedding full load the temporary speed rise was 5·0%, and the permanent speed rise 4·2%, using standard governing equipment.





Performance curves for 2,500 kW gas-turbo-generator corrected to atmospheric conditions of 14·7 lb/sq. in. abs. 59° F. The curve above shows the thermal efficiency plotted against output while that on the right illustrates the variation in specific heat consumption plotted again against the kW output

READERS' VIEWS

Correspondents writing under a pseudonym are asked to submit their names in confidence to the Editor

Winter and the Domestic Heat Pump

I WOULD like to reply to the point made by Prometheus in his letter published in your issue of 10th November. On the face of it, his suggestion that the heat pump may be "pinching" heat from the house when the outside temperature is below 45° F sounds reasonable enough.

I would like to make the following points to help "elucidate this anomaly" as Prometheus puts it.

(1) When the ambient temperature is below 45° F, the extraction rate of the machine is approximately 500 W. This means that we are only dealing with marginal quantities.

(2) Generally the larder adjoins the kitchen and the kitchen, when in use, tends to be overheated even during the winter. The 500 W extraction rate is of very little consequence and will certainly not require the burning of additional fuel.

(3) If the kitchen is not centrally heated then the operation of a heat pump will not mean a cold kitchen first thing in the morning since temperature differences between kitchen and outside air would, in any case, have been reduced to practically the same level.

(4) Throughout the winter, it was not, in fact, found necessary to burn any additional fuel to maintain kitchen temperatures in any of our test installations nor have any complaints been received from customers on this score.

B. Z. de Ferranti,
Manager, DOMESTIC APPLIANCE DEPT.

Earthing Tests

WHILST I welcome the new 13th Edition of the I.E.E. Regulations, I feel that the new regulations regarding earthing are subject to criticism. Abandonment of the earth-free situation and the introduction of the earth fault loop impedance test are great steps forward in the prevention of accidents, i.e. fire and shock—the former often being overlooked. But Regulation 406 "The basic requirements for earthing," in practice, will prove to be, in my opinion, a problem.

It seems to me that, whether you call Regulation 406 an improvement or not, depends upon the interpretations held of Regulation 1005 B—12th Edition, which, referring to the final earth connection to a water pipe, states, "the consumer's earth impedance shall be low enough, under *all conditions of soil resistivity* to permit the passage to earth under fault conditions of current necessary to blow the fuse . . . protecting the circuit. This Regulation has *generally been accepted* to mean that the impedance between the consumer's earth electrode and the general mass of earth should not exceed 1 ohm.

In some rural areas, with overhead distribution, the resistance between the supply authorities buried electrode —and the general mass of earth has been known to vary— according to weather conditions, and under Regulation 406 (13th Edition) it is permissible for the total earth impedance to be raised beyond 1 ohm, e.g., a 15 amp i/c switch fuse, protected by a supply authority's 30 amp fuse—this circuit could have a total earth fault loop impedance up to, but not exceeding, 2·7 ohm (240 V supply). Thus the position can arise where a consumer in house "A," with 30 amp main fuse, has an earth fault loop impedance of 0·4 ohm. But for the consumer, in house "B," with a similar installation, the result of test could be 2·6 ohms, It is possible that in house "B" most of the extra resistance, say 2·2 ohms, is between the consumer's earth electrode and the general mass of earth. With screw barrel water pipe in poor soil this is quite common. However, both these installations would comply with the 13th Edition. Now, if the resistance between the supply authorities buried electrode and the general mass of earth increased from 0·2 to 5·4 ohms (owing to weather conditions—also fault current sometimes increases resistance) this, under fault conditions, could result in a serious situation.

Consider, for example, an earth fault on the consumer's installation— a subcircuit protected by a 30 amp fuse in house "B" would result in that particular phase taking earth potential whilst the potentials of the other lines to earth would raise to the value equal to line pressure, whereas neutral (solid!) to earth would give phase voltage. Therefore, by allowing an impedance of over 1 ohm between the consumer's earth and the general mass of earth —can be aptly termed as *adding fuel to the fire.*

Another point: A cooker circuit with an earth fault loop impedance of 2·6 ohms. This could be assumed to be satisfactory. But it is possible (and probable) that most of the resistance could be across a water pipe screwed joint on the consumer's premises between the earth connection and the general mass of earth, and if the consumer had a 30 amp re-wireable fuse with a fusing factor of 2 melting at 60 amps, the "40 V potential" between pipework would be well exceeded under fault conditions. I would like to point out that it is not always possible to test the continuity of water pipes. In some rural houses the water main runs through all houses above ground, and there could be a sufficient resistance—across a joint in another house to brake the 40 V potential rule. If the contractor is not too happy about the results of the new recommended method of testing, and takes further tests to ensure that the impedance between the consumer's earthing (throughout) and the general mass of earth does not exceed 1 ohm . . . why then purchase this new testing instrument to test the effectiveness of the supply authorities earthing?

My last point is in the nature of a query. Should the supply authority replace its 30 amp h.r.c. fuse with a 60 amp . . . thus cutting down the loop impedance maximum from 2·7 to 1·3 ohm and placing the consumer outside the safety requirements . . . who pays for the earth leakage circuit-breaker which would then be required?! This could happen where two consumers are supplied from the one "cut-out" (30 amp fuse) and it becomes necessary to increase the fuse to 60 amps because consumer "B" has an additional load connected.

In summing, I would like to add that my remarks are mainly applicable to rural areas which are subject to earthing difficulties. And if one gives a supply to a new connection—when earthing conditions are good, and permits a consumer to start with credit of over 2 ohms in his earth fault loop impedance, it can only be regarded as "not so good." Therefore, it appears to me to be another "Theory v Practice" case and it would be interesting to have readers views on the subject.

Thomas A. Stopford,
GRAVESEND.

OUTLOOK FOR NUCLEAR

Electricity generation problems and prospects discussed at inaugural meeting

A MOST impressive assembly of engineers, including many leaders of the industry, gathered at the Institution of Civil Engineers' headquarters last week for the inaugural meeting of the British Nuclear Energy Conference. This organisation has been formed jointly by the three senior engineering institutions, the Institute of Physics and the Institution of Chemical Engineers to be a collaborating and co-ordinating body rather than a controlling body for papers read in the field of nuclear engineering. The main objects of the Conference are to assist in obtaining papers on subjects relating to nuclear energy, to arrange for the printing and publishing of those papers, and to promote meetings and symposia on both a national and international basis.

Sir Christopher Hinton (Managing Director, Industrial Group, U.K. Atomic Energy Authority) was in the chair for the inaugural meeting, and in his introductory remarks he said that in ten years nuclear energy had so developed that it was an important industry in its own right. He forecast that by 1975 it will involve business in the home market amounting to some £300m per year. It is important, Sir Christopher continued, not to regard nuclear engineering as a new technology. Rather it is an extension of existing technologies, and we owe our present satisfactory position in the field of nuclear energy not to our ability to evolve technologies which are completely revolutionary, so much as to the ability which has been shown in adapting and developing existing techniques to problems which are completely new.

Reaction Development

Four lectures were presented at the inaugural meeting, the first coming from that expert lecturer in nuclear subjects, Sir John Cockcroft. He outlined the work of the Research and Industrial groups of the U.K.A.E.A., and went on to describe the reactors which may follow the Calder Hall types. Harwell, he pointed out, is responsible for all basic nuclear measurements, and also for reactor physics. It calculates the properties of new types of reactor, and it builds any necessary low-energy models for investigation. The research group also designs and operates reactors used for research and testing work. In this latter connection, Sir John revealed that the Authority is now building a swimming pool type reactor for studying shielding. This will have 3 kg of highly enriched uranium, and will operate normally at a power level of 100 kW. For some time to come all large test reactors will have to be publicly owned just as are the largest and most advanced wind tunnels.

Design Stages

In designing a nuclear reactor, the first stage is to pick a general type from all the 900 and more possible combinations of fuel, moderator and coolant.

The White Paper envisages stage 2 reactors following the Calder Hall type towards the end of 1965, with water or liquid sodium as the heat transfer medium. For some time the Authority has been studying the two types of reactor, and it has been found that their economic advantages are very evenly balanced. The choice between them will probably have to be made on technical grounds. The best policy would seem to be to concentrate our resources on one of these reactor types.

Stage 3 reactors will be of the breeding type, either the homogeneous thorium cycle reactor, or the fast plutonium-fuelled design. Work is proceeding urgently on these, but the development period will be long. The late 1970's will be the earliest date for a large scale contribution of power from breeding reactors.

In developing a new reactor, the next stage after choosing the general type is the feasibility study. This involves mainly physicists, with preliminary work by chemists and engineers. If the reactor seems promising on the basis of this investigation, a design study is begun. For this there is a team of about 15 engineers and draughtsmen. Physicists have to build a low-energy model of the reactor system, and substantial additional work on material testing and fuel element investigations begins. At this stage the project is likely to be costing about £200,000 per year. At present, Harwell associates industry with each stage of reactor study: there are 42 people at Harwell from the various industrial groups. An example of the closeness of the co-operation going on is the present study of the homogeneous reactor which is being undertaken by the chemical industry, because it is essentially a chemical problem.

Sir John stated that natural uranium should be available from the Authority's production plants in the 1960's for any exports of nuclear plant, and the Authority will be willing to reprocess fuel for overseas users.

Electrical Outlook

The second lecture was that most interesting to electrical engineers. In it, Mr V. A. Pask (Chief Engineer, C.E.A.) and Mr J. C. Duckworth (Nuclear Power Engineer, C.E.A.) discussed the place of nuclear energy in British power development. The Calder Hall station expected to start up next year will be the first in the world to produce electricity in commercial quantities, but it is necessary to wait until 1961 for the first nuclear station designed primarily for electricity generation. Table 1 gives an estimate of the need of Great Britain for electricity up to 1980, and shows how the nuclear power programme will have to grow to meet this need in the absence of an in-

TABLE 1.—REQUIREMENTS FOR NUCLEAR POWER STATIONS

Year	1965–66	1970–71	1975–76	1980–81
Estimated peak load MW	34,500	43,500	55,500	70,500
Total plant required MW	39,000	49,500	63,000	80,000
Capacity coal-fired plant MW	33,600	41,600	47,700	54,400
Nuclear Generating plant MW	3,900	6,200	13,200	23,000
Units s.o. – 10^6 ...	136	176	229	295
Units – hydro 10^6 ...	3·5	4·5	6	8
Units coal 10^6 ...	107	131	136·5	140·5
Load factor coal plant %	36·4	35·9	32·7	29·5

POWER

of Nuclear Energy Conference

crease in coal output. It is noteworthy that the estimates set out in this table are greater than those given in the White Paper. If there is not a corresponding stepping up of the programme more coal will have to be imported. In any case, by 1980 all coal-fired plants will be operating on one or two-shift working.

The initial types of nuclear power station will be high in capital costs and more promising estimates for the more advanced types of reactor have led some to query whether the gas-cooled graphite-moderated reactor is the right initial choice. The authors say that if the strain on conventional fuel resources is to be lessened it is essential to go ahead with the gas-cooled reactor. Apart from fuel crisis considerations, the gas-cooled design is worth while for the plutonium it will contribute to later types of reactor.

The principal aim of the four design teams from industry working on C.E.A.-station designs is to increase the heat output that is obtained from the Calder Hall type of reactor. The two Calder Hall reactors cost about £16·5m. and the electrical output has been officially stated as "over 50 MW." There are hopes that the early C.E.A. stations will produce nearly 200 MW sent out from the two reactors with which they will be equipped. Construction cost may come down to £150/kW or less.

It is convenient to regard the cost of the initial charge of nuclear fuel as part of the capital cost, and this is likely to come out at about £25/kW. Taking an optimistic view, the initial cost may be £150/kW overall, and at a 20 year life and 4% interest rate, the capital cost is equivalent to 0·372 d/kWh at 75% load factor. Based on U.K.A.E.A. experience, other works costs may be 0·06d/kWh—higher than for a coal fired station, but increased reactor ratings should permit a reduction.

Fuel replacement costs depend on the time the fuel can be left in the reactor, and on the degree of conversion of uranium to plutonium. Accepting the White Paper estimate of 3,000 MW-days/tonne of fuel, and allowing a heat-electricity thermal efficiency of 25%, replacement fuel cost is 0·266 d/kWh. Thus the gross cost of electricity will, on these assumptions, be 0·698 d/kWh. Assuming only 170 MW output and 2,000 MWD/tonne burn-up, the cost comes to 0·917 d/kWh.

These gross costs do not make any allowance for the fact that when the fuel elements are removed from the reactor they contain an appreciable amount of plutonium, which is very costly to make in any other way. At present the worth of plutonium is about £12/gram. Allowing £2 for processing to separate it from the uranium, fission products, etc., a credit balance of £10/gram of uranium may be allowed in calculating the net cost of electricity. This reduces prices as shown in Table 2, and that table also gives corresponding prices for conventional steam stations. It should be noted that the lowest conventional costs are obtained partly from siting the station near the coal. Eventually nuclear stations will be sited near the load. It is forecast that the price of plutonium should remain fairly high until some time in the 1970's, when the increasing amounts available may begin to reduce its worth. But even if the price does fall, the possibility of recycling the fuel in place of fissile uranium 235 gives a reassuring future to the economics.

The authors expressed their confidence that in the long run, nuclear power can compete with any other form of electrical generation. It follows that any station now under construction should be made suitable for two-shift operation. This, of course, is mainly a question of quick starting and close attention is being given to the problem, even for the 200 MW sets.

Another approach made more urgent by the possibility of nuclear generation is the improvement of the load factor of thermal stations. This enhances the importance of pumped storage. At present the attraction of pumped storage is mainly in terms of reduction of hot standby plant during the summer months, but when the time comes for the base load to be carried by nuclear stations, this technique will become more attractive, and as much pumped storage capacity as possible will be required. It is however, unlikely that 2,000 MW of pumped storage can be exceeded in England, Wales and Southern Scotland, though if the more remote parts of northern Scotland are included, a substantial increase may be possible. In such a case transmission costs would reduce the attractiveness of the scheme.

The other approach being made to improve load factor is to encourage selective demand. Unfortunately the scope for a special night rate at present is small. If nuclear stations come into operation something better may be adopted. In the long run, three-shift working of industry seems the only real hope.

Discussion

This paper, which was most warmly received, was discussed by five speakers. First of all, Sir Christopher Hinton commented that the estimate of £55/kW for conventional stations showed a marked improvement over what was expected when the White Paper was drawn up, and half-humorously suggested that this was useful for the C.E.A. in bargaining with the U.K.A.E.A. about the price of fuel. Then came Mr J. Eccles (Deputy Chairman, Operations, C.E.A.) who devoted most of his remarks to the forecast of electricity demand. He stated that the energy requirements of the country in 1980 had been estimated at 400 million tons of coal equivalent, assuming full employment and desirable progress in the mechanisation of industry. At the present time the demand was for 254 million tons of coal equivalent. He personally thought the estimate to be too high, but accepting it he arrived at limits of nuclear power requirements by 1980 as 33 million tons of coal equivalent a year and 83 million tons of coal equivalent, according to how much oil was available for electricity generation by that time. The authors based their requirements on 62 million tons of coal equivalent.

The electricity authorities also had to consider whether the nuclear energy system could be created at the rate suggested by the authors. Effectively this required 115 stations each of 200 MW to be built by 1980. In the last five years of this period, the rate of commissioning would be 10 nuclear stations per year, assuming that the 200 MW size was maintained. Personally, he thought that the pro-

TABLE 2.—COST OF ELECTRICITY GENERATION IN COAL-FIRED AND NUCLEAR STATIONS—PENCE/kWh

	Nuclear stations		Coal Stations	
	200 MW 3,000 MWD/t	170 MW 2,000 MWD/t	Base load	Coalfield base load
Gross cost	0·698	0·917	—	—
Credit for plutonium	0·266	0·266	—	—
Net cost	0·432	0·651	0·566	0·519

gramme suggested by the authors for the early years, about double that suggested in the White Paper, was impracticable. It was for this reason that the Authority was paying so much attention to conversion to oil burning. The programme for the later years he did not think unrealistic.

Mr Geoffrey Kennedy (Kennedy and Donkin) emphasised the importance of the export business which might come from nuclear energy. He said that the cost of coal must be substantially higher by the time nuclear power stations came into operation, so the economics of nuclear power had a good margin.

Both from the export aspect and from that of conserving coal stocks for use as a raw material in the chemical industry, he considered that urgent consideration should be given to building more advanced types of station, so that consulting engineers and manufacturers could impress overseas customers with their width of experience in the nuclear field.

Mr A. L. G. Lindley (Director & General Manager, Fraser & Chalmers Engineering Works, G.E.C.) said there was really no evidence on the cost of stations or fuel in 1980. If plant of the order of £300 or £600 million was to be expected by 1965, then an extremely heavy load was being placed on industry, not only from manufacturing facilities, but also from the aspect of capital. Only in the last two years had industry become intimately aware of the plans and problems of nuclear power.

The demand for suitable men to staff the new work was particularly worrying to industry, which had to continue with development work in many other fields. The electrical manufacturing industry has had to make the sacrifice of transferring men from other projects that are urgent, to nuclear work.

The final speaker in this discussion was Sir Claude Gibb (Parsons and the Nuclear Power Plant Co.). He said that industry could and must meet the nuclear programme. The technical effort needed to produce a nuclear power plant was not all that much different from that for conventional fuel.

He thought that the debunking nature of the paper was particularly valuable. It was a cruel fact that there was not sufficient coal for both electricity and the chemical industry. He criticised strongly the extensive coal importing programme, and stressed the danger of relying on oil more than was essential, but particularly commended the building of the gas-cooled graphite-moderated reactor. Such reactors, however, were only competitive when built in large ratings. This meant that they might be unsuitable for export in the immediate future; but those who had made a close study of the possibilities of export in the nuclear field were less optimistic than a year ago.

Health and Safety

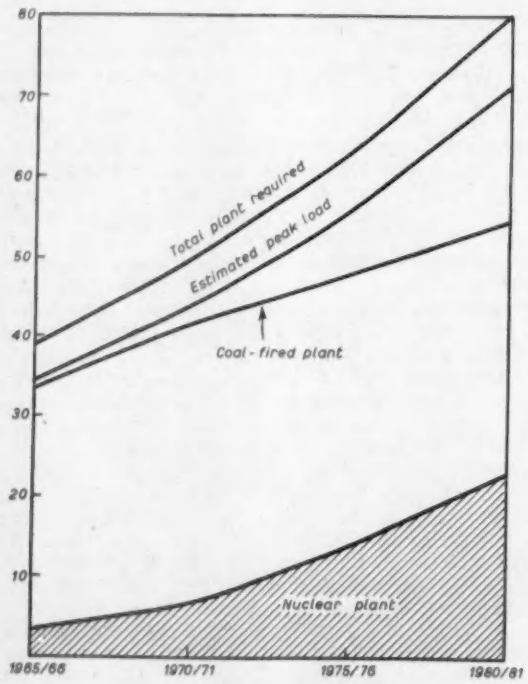
Health and safety problems in the nuclear power industry were dealt with by Drs A. S. McLean and W. G. Marley. Both authors contributed to the lecture, and Dr McLean began with a consideration of the medical aspects of the subject. He pointed out that nuclear plant has been in operation in this country for almost the whole of the past decade. In the early days, strangeness of the problems involved led to excessive caution, but there has been some relaxation with the building up of experience and confidence. Radiation injury problems are now being measured in terms of risks in other industries. Thoroughly satisfactory protection can be provided for both workpeople and for the general people in the neighbourhood of a nuclear works. The need now is for this experience and confidence to be shared with the general public.

Radiation injuries can of course be extremely grave and only occasionally are they reversible by treatment. However, the doses that can cause the injury are very often known and there is no disease that is caused only by radiation. There is a difficulty, however, for employers if the onus of the proof of safety rests upon them. Their only defence is to appeal to statistics of normal cases, and these statistics are now being actively collected.

The incidence of disease among atom workers has been shown to present no abnormality unless it is measured in terms of sickness absence, which is far below the normal level. As yet the U.K. Atomic Energy Authority has had no case of radiation injury, nor has any strange disease been found amongst workers. The average exposure of workpeople in A.E.A. establishments is 1/30th of the maximum permissible level of external contamination.

In considering safety in relation to radiation, account must be taken of the radiation present in the environment quite apart from nuclear energy work. Some of this comes from natural sources, such as cosmic rays, and naturally occurring radio-active elements; other sources are man-made, such as luminous watches, x-ray machines and even certain types of television sets. From all such sources, the exposure on an average is 1/10th to 1/5th of a rad per year per head of the population (a rad is a measure of the dose—the amount of energy absorbed by the tissues).

Maximum permissible levels of irradiation are laid down by an international body and these involve a substantial margin of safety. The maximum permissible level of external gamma rays is set at 0·3 rad/week. If a man is exposed continually to the maximum permissible dose of radiation, the reduction in expectancy of life is of the same order as that calculated to be caused by smoking 4 cigarettes a day. The average level of irradiation in



Electricity requirements up to 1980. Mr Pask estimates that they will be satisfied, in the way shown in these curves, subject to a small contribution from hydro-generation and a large amount of oil-firing

atomic energy establishments has the same effect as smoking one cigarette a week.

All the levels quoted are put in terms of risk of injury to individuals, and not concerned with genetic affect.

A further reduction of 1/10th of maximum permissible levels is applied when the health of the public outside atomic energy establishments is concerned. The U.K. Atomic Energy Authority spends £50 per employee a year on health and safety precautions.

The second part of this lecture was delivered by Mr W. G. Marley, speaking as a health physicist. He described the practical implications of what Dr McLean had said.

In experiments, shielding is used to keep radiation limits down to 1/10th of the maximum permissible. In production work, where it is not necessary for individuals to remain for long in the vicinity of the apparatus, it is possible to approach the maximum value. There is no fundamental difficulty in getting thorough shielding, but it may be costly.

TABLE 3.—RELATIVE COSTS OF SHIELDING

Energy of particles	Lead	Iron	Ordinary concrete	Heavy concrete
1 MeV	100	70	4	14
5 MeV	150	140	10	40

Investigations are under way into all aspects of the disposal of the large quantities of waste products which will come from nuclear energy projects. Providing the two isotopes, Strontium 90 and Caesium 137 are separated out (their bulk is smal!) there is no difficulty about the rest of the products. The average radio-activity of the bulk declines by 4 magnitudes in 15 years.

Safety Opinions

Sir John Cockcroft (Harwell) briefly reviewed the early days of radio-protection, and commented on the great advances that have been made. He pointed out that the major hazards will be concentrated in the chemical plants, of which there are very few.

Mr H. N. Pemberton (Deputy Chief Engineer-Surveyor, Lloyds Register of Shipping) emphasised that in industrial power plants, one should not rely entirely on automatic control for safety. Of equal importance were high standards of engineering design, workmanship, checked by inspection and control at every point, and subsequent regular inspection. In nuclear plants, the main hazard was not necessarily explosion, but rather rupture of the outer casing leading to the release of fission products. The dangers of sabotage had also to be kept in mind, whether sabotage was due to unfriendly acts, or to mere mischief. He recommended that a responsible body should be recognised as early as possible as the appropriate approving concern for nuclear plant at all stages.

Mr A. W. Kenny (Radio Chemical Inspector, Engineering Division, Ministry of Housing and Local Government) emphasised the importance of the public knowing that their health was fully safeguarded. The recommendations of the International Commission on safety levels were made on a basis solely of health, with no regard to cost. In applying those limits further factors of safety were put in. He reviewed the precautions taken under orders and statutes to control radiation.

Mr H. G. Davey (Works General Manager, Windscale and Calder Hall) said that in five years' operating experience and production reactors there had been no case of serious over-exposure. He emphasised the importance of having on design teams engineers experienced in the Factory Acts and in current industrial practices, and recommended that an eye should be kept on the "gadgeteer." There was a lot to be said for bringing operating staff as early as possible on to the construction side, so that they could take part in the test and inspection of the apparatus they would have to control. He also mentioned that the developing idea of a reactor as something that could be maintained, must in the future modify design.

Research Reactors

The final paper presented to the conference came from Mr H. J. Grout, of the Reactor Engineering Division at Harwell. His subject was the use of research reactors in nuclear power development. No background of experience is as yet available to guide engineers in the specification and design of nuclear reactors and it is, therefore, particularly important for them to be backed by adequate research facilities.

One of the important tasks to be carried out is the testing of prototype units of power reactor designs. In this respect two limitations have to be recognised. First, it is impossible to carry out accelerated tests on a full-sized prototype to establish permissible rates of fuel burn-up, since operating a fuel element at many times its design rating radically alters many of the factors which contribute to failure. The second difficulty is that fission under certain test conditions takes place only in the thin outer layer of the fuel element. In these circumstances results cannot be used to predict the behaviour of the reactor under full power operating conditions.

At present the U.K.A.E.A. has under construction a high-flux general-purpose reactor of the heavy water, enriched uranium type, and the reactor for testing shielding which Sir John Cockcroft mentioned, while three additional reactors are planned which will provide a maximum neutron flux of 10^{14} neutrons/sq cm/sec. All three will operate at a thermal output of about 10 MW, and the first, DIDO, should commence operations in Autumn, 1956.

Opening the discussion on this paper, Mr D. R. Chick (head of the nuclear physics research laboratories, A.E.I.) said that industry would certainly need fluxes above 10^{13} neutrons/sq cm/sec. They needed facilities for testing proposed fuel elements and assemblies, and there was also an urgent need for reactor facilities under the control of industry to give the general "feel" of the problem, to make it possible to do some designing in earnest. Industry was at least ten years behind the A.E.A. in this respect: at some time industry might wish to challenge the conclusions and ideas of the A.E.A. by appeal to experiment. His organisation had been studying a swimming pool reactor to operate at 1 MW continuously with a fuel investment of 6 kg of enriched fuel, giving a flux of a few times 10^{13} neutrons/sq cm/sec.

Dr H. S. Arms (Chief Engineer, English Co.) said that for the next few years research facilities should be owned and operated by the A.E.A., but that there might be an argument for the Authority to make space available in them to industry under contract. Eventually industry might wish to own reactors itself, but the cost would be very high.

Prof J. Diamond (Manchester University) said that research fluxes of 10^{15} would be required eventually. Dr J. V. Dunworth, who closed the discussion put the capital charge for reactors in the 10^{14} flux field at £2·5m, with annual operating charges at £250,000 per year. With a flux of 10^{15}, the operating cost might well reach one million pounds a year.

around the trade

by Peregrin

THE recently-announced "self-service" experiment in wholesaling is a worthy effort to help everyone concerned, and just the kind of novel enterprise we are accustomed to expect from wholesalers, especially this particular firm. It will no doubt provoke criticism from those who dislike change, and others who grumble from force of habit, but with a little co-operation from the important partner in the venture—the customer—it should be a big improvement over the present wait-your-turn system. In this country self-service retailing, such as it is, does not find favour with most people, customers or suppliers. At the best it is regarded as a bit of a nuisance and a temporary expedient until normal conditions can restore over-the-counter selling.

It is nothing like that in the United States. Over there they call them "super-markets," and though they vary in size and scope, many of them are indeed super. I saw one in New Orleans that looked about as big as Olympia, surrounded by a car park even bigger. There is little that cannot be bought in these enormous single-floor stores. It is not just a matter of a packet of soap and a pound of butter. You can buy, *inter alia*, a joint of meat, a dustbin, an electric fire, a TV set, a dress, a hat, get measured for a suit and have your hair cut. I have even seen pianos and furniture suites on show, but I imagine those have to be ordered for delivery later. Most of the customers were housewives and seemed in a hurry They grabbed their little trollies, dashed through the store, and were back in their cars in no time. Very few loitered. The most fascinating feature to me was the girl at the cash desk. As each customer appeared with her trolley, bearing packets and articles of various sizes and prices, this girl just glanced for a moment at the collection and then rang up the total on the register, without any apparent effort at reckoning. Presumably she was right every time for no one disputed the amount she charged. This, in fact, will be the delaying stage in self-service wholesaling. A customer may collect all he needs in a few minutes and then have to queue up while his purchases are laboriously booked out.

I wonder if this firm of wholesalers studied the American super-markets, and discovered their big advantage. In this method of retailing with its unlimited scope for display, the customer not only buys what she goes in for, but also a good many things not on her shopping list, and goes out with twice as many purchases as she intended. It could happen in electrical wholesaling.

Blanket Safety

December not only brings us the Festive Season, but rain, frost, fog and much personal discomfort. It also helps the enterprising electrical retailer to sell blankets and medical lamps. The electric blanket seems to be under a cloud just now, but unfairly so and it will soon re-emerge without a stain on its character It is one of the best of the many electrical aids to comfort, and as safe as any other when used as intended to be used. So far as I know, there is no serious movement to abolish bowl fires just because now and again someone plugs one into a lampholder and perches it on the edge of the bath. No more should electric blankets be condemned because one that had received no attention for nine years was mis-used with tragic result. They are indeed safe, but the wise dealer will not keep harping on the safety aspect. If the word is repeated too often, a nervous customer may begin to fear that there must be some dreadful danger lurking if so much safety emphasis is really necessary.

So with ultra-violet and heat lamps, all this current jargon about prescription lamps and medical certificates is likely to deter rather than encourage sales, and lead a customer to think that he can use a taxable lamp with perfect safety but if he has one free of tax he ought not to use it without a doctor being present. He could even be excused for complaining that if he is ailing he can buy a tax-free lamp to cure him, but if he is well and wants to remain so he must pay purchase tax. The position is of course that the recent supplementary regulations merely offer a welcome tax concession when certain simple formalities are observed. There is no intention of making health lamps more difficult to buy, nor to brand them with an element of danger which does not exist when they are properly used. Here again, doubts may arise in the customer's mind if the dealer unduly stresses the question of danger and safety. He need only treat his customer as an ordinary intelligent citizen. After all, if we buy a car capable of 90 m.p.h. the salesman does not keep assuring us how safe it is, yet that is far more lethal than an electric blanket or sun lamp, when used carelessly.

There is a vast market for these ideal Christmas presents, many of us are feeling the need for them now that the trials of winter make us think wistfully of that now distant but unforgettable summer.

Automation at Home

That much publicised boon of civilisation, Automation, is usually associated with industrial processes, but the Americans are beginning to find domestic uses for it, including armchair remote control. One well-known and expensive television receiver has four selenium cells embodied in the front, one at each corner. The tired owner remains in his chair, equipped with a torch shaped like a pistol, and by aiming at the appropriate spot he can switch on and off, tune in vision, adjust brightness and switch off the sound only. The last feature is blandly advertised as "for cutting out unwanted 'Commercials'," so one assumes that the makers of this particular receiver do not advertise on TV and care little for those who do. There are endless possibilities in this aid to the indolent. One imagines, for instance, husband and wife, each armed with a light pistol, with one wishing to have the TV programme on and the other determined not to. It is not explained how the device operates in a well-lit room or in daylight, but no doubt the makers have thought of that.

Feeding the Flyer

CATERING PROBLEMS AND THEIR SOLUTION AT LONDON AIRPORT

FEEDING passengers on air liners presents peculiar problems outside the normal run of catering difficulties. Flights are at the mercy of weather conditions and schedules may be upset or cancelled at short notice. Menus are restricted due to changes of appearance in certain foods in the time between cooking and reheating, smell and possible digestive difficulties at high altitudes. Special menus must be provided for travellers who may possess religious scruples.

For the preparation of this food, a new large modern kitchen has been constructed in the S.E. Face Passenger Handling Building in the Central Area, and is staffed with 21 people in two shifts with a night skeleton staff.

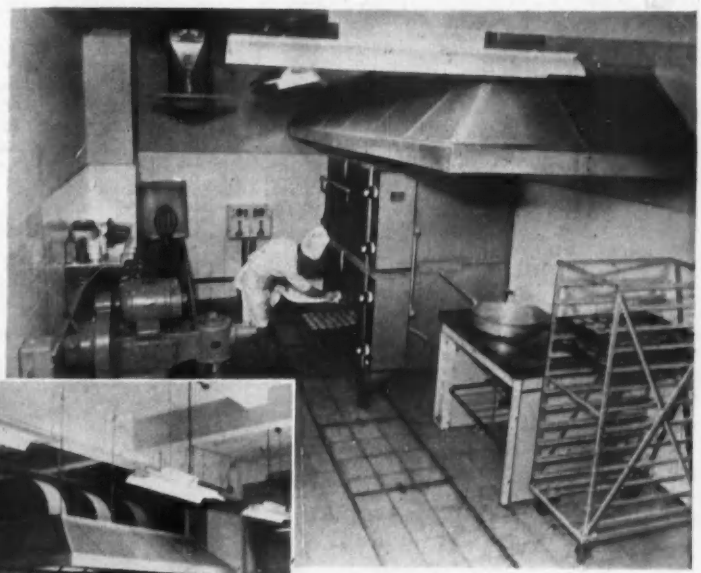
Careful planning was, of course, necessary. The larder, stockrooms and 650 cu ft cold room lead directly to the meat and vegetable preparation sections, which in turn feed the main cooking areas. The vegetable cooking section has a 30-gallon steam-jacketed boiling pan, a 7½ cu ft steaming oven, a single pan fryer, and an open bath bain marie. Meat and poultry go to a 30 cu ft cabinet roasting oven which can roast 300 lb of meat at a single charge and an oven range consisting of two standard double oven ranges placed back to back. The ovens, of 8 cu ft capacity are so lagged as to enable them to be used independently. Over each oven are four hotplates measuring 12 in. by 8 in. and two measuring 8 in. by 6 in., and adjacent to the oven are two grills each with a grilling area of 22 in. by 20 in., and each capable of handling 16 to 20 steaks or chops. The confectionary room contains a double-deck pastry oven, a twelve-tray proving oven, a boiling table and a 50-quart capacity mixing machine.

The cooked food is transferred to "sky plates" and to keep it hot the "sky plates" are loaded into electrically-heated containers developed by the G.E.C. for use on aircraft circuits. To supply power to the containers while they are in the kitchen, two double-wound stepdown transformers with a ratio of 230/28 V and a rating of 2 kW are provided.

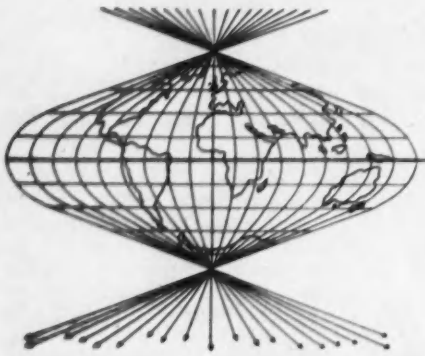
Other items in the kitchen include a 28 lb capacity potato peeler, a power unit with slicer, chipper and grater plate attachments, a mincing machine and other items.

Services within the kitchen, provided by the G.E.C. (who were main contractors for the complete supply, erection and installation, including all services) comprise the main electrical switchboard, distribution board and local control gear, wiring ducts, conduits, circuit wiring and final connections. The main wiring is carried in a G.E.C. 2 in. by 1½ in. under-floor ducting system.

The complete kitchen is under the direction of Mr Dudley Gibbons, F.H.C.I., catering manager, British European Airways. Catering officer for the B.E.A. at London Airport is Mr Jeanmond. Architect for all work carried out at London Airport is Frederick Gibberd, C.B.E., F.R.I.B.A., M.T.P.I. Consulting Engineers were G. H. Buckle and Partners for mechanical services, and Ewbank and Partners for electrical services and the L.E.B. carried out the installation.



Above double deck oven in the confectionery room of the B.E.A. kitchen at London Airport Left, preparing "sky plates" in the kitchen prior to transporting them to the aircraft



OVERSEAS NEWS

A SUMMARY OF IMPORTANT EVENTS

CANADA

Vancouver Cable Order

The British Columbia Electric Co., Ltd., is to spend a further $1,000,000 on the 138 kV submarine gas-pressure cable with British Insulated Callender's Cables Ltd. Instead of a total of 77 miles as originally ordered, 95 miles of cable are now to be supplied so that the line will comprise five single-conductor cables instead of four, of which two will now be in reserve. Work on laying the cable across the Georgia Strait from the mainland to Vancouver Island, is scheduled to start next June. It will be shipped abroad the *Ocean Layer*.

New Scheme for B.C.

A plan for a dam and power development on the Nass River, in North West British Columbia, to develop 450,000 h.p., have been prepared by Frobisher Ltd, it has been announced. That concern's subsidiary, North West Power Industries Ltd. is involved in the scheme which has been drawn up because the company's earlier plans to utilise the Taku River have since been temporarily blocked by the Government's legislation. The new scheme would involve the erection of a transmission line 32 miles to the head of Alice Arm on the coast, where it was proposed to erect an electric smelting plant.

Power for Aluminium

The initial power requirements of the proposed new $130m plant of British Aluminium Ltd., to be built at Baie Comeau, Quebec, will be supplied by the Manicouagan Power Co., we learn. Initially, the quantity may be about 120,000 h.p. by 1957, the target date set for the inauguration of the plant. It seems likely that the Manicouagan Power Co. will increase its power output either by regulating the river flow or by adding further generators to its existing 90,000 h.p. station on the Manicouagan River. The station has been designed for an ultimate capacity of 270,000 h.p. made up of six 45,000 h.p. machines.

A Long Line

One of the longest overhead power line crossings in the world is to be strung across Jervis Inlet by the British Columbia Electric Co. The line will be 10,100 ft across, between towers, at the 1,606 ft level on Nelson Island and the 250 ft level on the mainland. (The line across the Messina Straits between Sicily and Italy has a horizontal length of 11,950 ft). The company are also planning the installation of an underwater cable between the mainland and Texada Island. It was decided to put an overhead line across Jervis Inlet because of the heavy tidal currents and the inlet's rocky bottom.

HONDURAS

Finance Wanted

A Honduras Government mission is now in Washington to finalise details of a loan of $4½ millions from the International Bank for Reconstruction and Development. Part of the loan is intended for electrification purposes. It is understood that this loan is the first of a series to be obtained from the general mechanisation of agriculture and for electrification in Honduras.

U.S.A.

Transformer Contract

A contract for one 90,750/121,000 kVA 13·2/161 kV 3-ph, 60 cycles, power transformer for the switchyard at Table Rock Dam, South West Missouri, has been placed with the English Electric Co., Ltd., by the U.S. Army Corps of Engineers. It will be recalled that earlier this year the company were the lowest bidder against the first invitation for this same contract but all bids were cancelled and the invitation re-issued. The transformer will serve two generators each rated at 52,632 kVA. A year ago English Electric was awarded the contract for the two 68,000 h.p. vertical Francis water turbines for this project. The new transformer will be of the two-winding, oil immersed, self-cooled, forced-air cooled type, suitable for outdoor operation.

The English Electric Co. has also just received a $450,000 order for four 40,000 kVA single-phase transformers from the Tennessee Valley Authority. The company's tender was about $350,000 lower than the lowest American bid.

Another Project

A plan for a hydro-electric project at Priest Rapids dam on the Columbia River, has been prepared by the Public Utility District of Grant County, U.S.A., who intend to invite tenders for construction work and the necessary plant early next year, we understand. The station is planned to house ten generating sets operating on a head of 81 ft, although only eight sets will be installed initially. The generators will be 79,000 kVA, 13·8 kV units driven at 85·7 r.p.m. by 114,000 h.p. Kaplan-type turbines.

POLAND

Next on the List

The largest power station to be built under Poland's next Five-Year Plan (1956-1960) will be near Scinawa, Lower Silesia, on the River Odra. It will be larger than the Jaworzno station, Cracow, now under construction. The new power station will also be built to Russian design, and will have high-pressure boiler plant fired with brown coal. It is expected that preparations will commence next year and actual construction work will start in 1957. Under present plans, it is hoped to have the first generating set in operation in 1959.

AFRICA

Coal or Nuclear?

Doubts of the advisability of proceeding with proposals for the construction of further coal fired power stations in the Western Cape at the present time were expressed by Major A. Z. Berman, chairman of the Finance Committee of Cape Town Council, in his Budget speech last week. He pointed out that included in the city's capital works estimated to cost £53 millions over the next ten years, was a new steam power station at Athlone which would cost about £13 millions. Major Berman feels that if nuclear energy at an economic price became available within the next seven to ten years, the project might become relatively obsolete long before its completion.

EGYPT

Finance for Aswan

Egypt has "successfully concluded" a loan from the World Bank for the new high dam at Aswan, according to Egypt's Minister for National Production. The Finance Minister, who had talks with the World Bank in Washington, has flown back to Cairo to report to the Egyptian Premier, Col Nasser. Egypt had been seeking a $200 millions loan from the World Bank to help finance construction of the new dam.

INDIA

Traction Order

An order valued at Rs. 4½ millions (about £337,500) has been placed with Associated Electrical Industries Ltd. for electrical equipment for the electrification of the Calcutta Suburban Railway. Other orders totalling over Rs. 18 millions have been placed with Italian, West German and Indian firms. Societa Anonima Electricita, of Italy, gets an order worth Rs. 15 millions and Protos, of W. Germany, an order valued at 900,000 rupees. It will be recalled that an order worth about £900,000 was placed with A.E.I. (India) Ltd., in June last for electric traction equipment for Calcutta.

Acquisition

The Andhra Government has decided to acquire the remaining eleven privately-owned electricity undertakings in the State before Mar. next year. A decision to this effect was taken at a conference of officials last month. Mr G. Latchanna, Minister for Electricity, said that two generators each of 9,000 kW would be commissioned at the Tungabhadra project by June next year and two more by the middle of 1957. The rural electrification programme will be speeded up and before the end of the current financial year, 150 more villages would receive power supply.

Madras Scheme

A further hydro-electric project now under investigation in India is at Kundah, in Madras. It will, if approved, be bigger than the Mayurakshi power and irrigation project. The Canadian concern, Montreal Engineering, are the consultants engaged to investigate and report on the project.

AUSTRALIA

Queensland's Bright Outlook

Plans are being prepared to cover the power needs of Queensland up to 1965 and beyond, a sub-committee having been set up by the State Electricity Commission to make recommendations for developing power stations in South-east Queensland following the completion of extensions planned for Tennyson and Bulimba generating stations. Giving this information in his annual report, Mr Neil Smith, the State Electricity Commissioner, says the committee will consider the alternatives of the continuous development of the Brisbane City Council and Southern Electric Authority system as independent, but inter-connected systems, and the possible amalgamation of the two authorities. Mr Smith adds that there should be no fear of blackouts in the State in future, even though the rate of increase in the demand for electricity in the State since 1938 had been much greater than for the whole of Australia.

NEW ZEALAND

Gas and Electricity Merger

Struggling to keep alive the sickening gas industry in New Zealand, the Government are proposing legislation under which electricity supply undertakings will be compelled to take over and operate gasworks in their area which have been declared essential. The draft legislation stipulates that the takeover shall be within three months of notice being given that the particular gasworks are essential. It is proposed to set up a gas and electricity co-ordination committee of five persons, who will recommend to the Government which gasworks shall be declared essential. There are 36 gas works with a capital value of about £7m. A number are already controlled by municipal authorities. The present Government subsidy of 2s. per 1,000 cu ft of gas is to continue only until 31 Mar., 1957. In announcing this, Mr Goosman, Minister of Works, said gas made up 13% of the total heat and power supply in New Zealand, and to replace it by electricity would cost about £25m—even if it was possible, for the country was flat out on its present programme. To let the gas industry die would put an injustice on gas users. There was nothing to replace it at the present time. Mr Goosman subsequently made it clear that the complete gasworks, including by-products, would be taken over. Officials in the Electricity Supply Industry are not happy at the proposals. There have been objections to the suggestion that losses in the gas industry should be borne by electricity consumers. Some officials even feel that if the Government's proposals were cold-shouldered, the existing electricity supply undertakings might lose their identity under nationalisation. A special committee of the Supply Authorities' Association has been set up to consider the proposals. Meanwhile, Mr J. W. Nissen, secretary of the State Hydro-Electric Department, has estimated that the price of electricity will increase by 0·028d. if gas and electricity charges are to be equated.

Future Planning

New Zealand is approaching the end of its first 1,000 MW of installed electrical capacity, and work now in hand or due to start will complete another 1,000 MW in the next 10 years. This increase in the dominion's power development was referred to by Mr A. E. Davenport, general manager of the State Hydro-Electric Department, in an address to the Electrical Supply Authorities Association recently. The country's 1975 estimated power requirements show the need of planning for 3,400 MW by that time, with no margin allowed, he said. If the North and South Islands were not separated by Cook Strait there would be little cause for worry over the nature of our future electrical development, he continued. If time shows us a way to put an end to the electrical separation, stations could then be concentrated where nature has made abundant provision—in the South Island—which by such development would gain in population and in prosperity. Capital invested in the electricity supply industry would increase to £378m at the present rate. By 1975, assuming the cost of the work was stabilised at estimated 1960 prices, the total capital investment would reach about £680m, he added.

KUIBYSHEV DAM COMPLETE

Although work on Russia's massive Kuibyshev hydro-electric scheme has been delayed—it was originally scheduled to be finished earlier this year—the damming of the River Volga has now been completed. Our picture alongside shows the work involved in building up the concrete and rock wall which diverted the waters of the Volga into the newly built channel. Material was dumped into the river to build up the wall. Construction of the Kuibyshev project began in 1950, but there is doubt whether the power station will be in operation by the end of this year. The station is to have twenty turbo-alternators each with an output of 108·5 MW at minimum flow and 126 MW at the normal head of 22·5 metres. Annual output of the completed station has been estimated at 10,000 million units. The station will feed into the proposed 400 kV main transmission system, to which we referred on 15 Sept.

Personalities

IN THE INDUSTRY

Previously managing director of the Brush Group's export companies, **Mr J. P. Ford** has now been appointed managing director of Charles Colston Ltd., the company formed earlier this year by Sir Charles Colston (formerly of Hoover's) to produce domestic labour-saving appliances. Mr Ford, who is chairman of the Institute of Export and a council member of the London Chamber of Commerce, has had a wide experience which covers light and heavy engineering, scientific instruments and i.c. engines.

Dr D. S. McIlhagger, M.SC., PH.D., A.M.I.E.E., has been appointed to a lectureship in electrical engineering at the Queen's University of Belfast. At the same University **Mr J. M. W. McBride,** B.SC., A.M.I.E.E., has been appointed to a lectureship in light electrical engineering.

Following the recent formation of Square D Ltd., specialists in electrical control gear and switchgear, it is announced that **Mr H. Dale Langley** has been appointed technical manager in the U.K., with ultimate responsibility for technical liaison with British manufacturers. The new company is an associate of the Square D Company of America. Mr Langley is a B.SC. graduate of an American university and he has been associated with the American Square D Co. since June, 1950. As application engineer, he was responsible for general development of adjustable speed drive systems. He has also had considerable experience in the steel and electric motor industries in the U.S.A.

It was officially announced last Thursday that **Mr W. B. Noddings,** M.ENG., M.I.E.E., has been appointed head of the Commercial Department of the Central Electricity Authority, as we intimated last week. Mr Noddings, who has been a deputy commercial manager of the Authority since 1948, succeeds **Mr E. R. Wilkinson,** M.I.E.E., M.I.MECH.E., who, as we recently reported, is relinquishing his post at the end of this year to join the boards of Power Securities Corporation Ltd., and of Balfour, Beatty and Co., Ltd. Mr Noddings is a graduate of Liverpool University where, in 1923, he took the B.ENG.(HONS.) degree with first-class honours. After early training with the Metropolitan-Vickers Electrical Co., Ltd., he became an assistant engineer with Merz and McLellan. He then joined the Central Electricity Board in 1928 as an assistant engineer and in 1944 was appointed assistant commercial manager. In 1946 he became deputy commercial manager of the Board, a post he held until the reorganisation of the electricity supply industry in 1948, when he took up his present position with the Authority.

Nominated to be the new chairman of the South Western Electricity Board is **Mr A. N. Irens,** M.I.E.E., who, in addition to being a part-time member of the Board since its formation in 1948, is chief electrical engineer and general services engineer to the Bristol Aeroplane Co., Ltd., and carries on a practice as a consulting engineer. The Bristol Aeroplane Co. has agreed to release him to take up the new appointment on 1 Mar. Born in India in 1911, Mr Irens was educated at Blundell's School, Tiverton, and at Faraday House Electrical Engineering College, London, gaining practical training with Fielding and Platt Ltd., and Metropolitan-Vickers. In 1933 he joined the General Electric Co., Ltd., and later became sales engineer (central stations). He went to the Bristol Aeroplane Co. in 1939 as assistant electrical engineer, being promoted to chief electrical engineer in 1943, since when his responsibilities have been further extended. In this post he has supervised the company's engineering services and has been responsible for the setting up of power stations in various parts of the works. During the immediate post-war years he served on the Bristol District Committee of the Regional Board for Industry, was chairman of the I.E.E. Utilisation Section in 1950-51, and chairman of the Western Centre, in 1954-55.

The present deputy chairman of the South Western Electricity Board, **Mr Harold Midgley,** M.SC., M.INST.C.E., M.I.E.E., has received medical advice to relinquish his duties as soon as possible, and has agreed, in view of the change of chairmanship noted above to continue for a short time after Mr Irens has taken up his new appointment, we learn. Mr Midgley, who has been deputy chairman of the Board since its formation, is also chairman of the Board's Civil Defence Panel, a member of the N.J.B. Negotiating Committee, in addition to being a member of the N.J.C. and of other councils. Prior to 1948 he was city electrical engineer at Plymouth from 1934. He served an apprenticeship in the Marine Engineering Works of R. and W. Hawthorn Leslie and attended Armstrong College (Durham University). Following varied post-apprenticeship experience, he spent some time as principal assistant in the General Engineering Department of Metropolitan-Vickers Electrical Co. This was followed by 13 years' service in various capacities in the Liverpool Corporation Electric Supply Department, latterly as chief technical assistant, when his work included supervision of the early stages of construction of Clarence Dock power station. He then went to Plymouth, where, during the war, he accomplished great things in restoring supplies after bombing. Mr Midgley will be in charge of the South Western Board during Jan. and Feb. next.

Senior assistant and deputy to the steam testing engineer of the North Eastern Division of the C.E.A. since 1950, **Mr R. L. Kay,** A.M.I.MECH.E., A.M.I.E.E., has been appointed steam testing engineer of that Division in succession to

Mr H. D. Langley

Mr W. B. Noddings

Mr A. N. Irens

Mr H. Midgley

Mr R. L. Kay

Mr P. G. Lloyd, A.M.I.E.E., who has retired. Mr Kay, after taking his early training with the Metropolitan-Vickers Electrical Co., Ltd., and the Edinburgh Corporation Electricity Department, joined the anti-submarine branch of the Admiralty in 1939 as an experimental assistant. He served successively as experimental officer of that branch, at the Anti-Submarine Experimental Establishment, and at the Torpedo Experimental Establishment, Greenock. In 1946 he was appointed Scientific Officer, Royal Naval Scientific Service, becoming senior scientific officer six months later. He joined the North Eastern Division of the Authority in 1950 as senior assistant and deputy to the steam testing engineer.

The National chairman of the Electrical Trades' Commercial Travellers' Association for the ensuing year, **Mr W. Candelatt,** whose election we briefly noted last week, has been with the Hotpoint Electric Appliance Co., Ltd., since 1928. Originally he joined them as a representative, covering a small area embodying the West End and City of London. Later he took over the Counties of Middlesex, Surrey, Sussex and Kent. He joined the E.T.C.T.A. in 1945, was elected a member of the Council and became secretary to the Council in 1950.

Mr F. D. Newcombe, who has been chairman of the Exeter branch of the Electrical Industries Benevolent Association from its inception, having expressed his wish to retire from that office, **Mr Harold Peters,** who has been holding the office of honorary secretary, has been appointed to take his place. **Mr W. H. Mortimer** is the new honorary secretary, and **Mr W. A. Dobson** is honorary treasurer of the branch. Both Mr Newcombe and Mr Peters are old in their service to E.I.B.A., Mr Peters having previously been hon. branch secretary at Leeds.

Mr G. R. Blakely, B.SC.(ENG.), M.INST. C.E., M.I.MECH.E., M.I.PROD.E., has been appointed to the board of G. A. Harvey and Co. (London) Ltd., as works director. He joined the company in 1952 as general works manager.

The term of office of **Mr N. M. Speer** as general manager of the Auckland Electric Power Board, New Zealand, has been extended by a further year. This is the second extension, the first being made just over a year ago when Mr Speer reached the age of 60 and completed 40 years' service with the Board. In recommending the extension, **Mr J. A. Steele,** chairman of the Board, said that the Board was still facing many problems and it would be a sad thing to lose Mr Speer's services at this stage

Mr Leslie Gamage has resigned as president of the Anglo-Israel Chamber of Commerce owing to pressure of his business.

At the anniversary meeting of the Royal Society last Thursday, **Sir Cyril Hinshelwood,** Professor of Chemistry in the University of Oxford, was elected President of the Society.

Mr W. Candelatt

Mr R. D. Lee

Mr M. H. Moss

Newly appointed as manager of the Sales and Plant Departments of British Central Electrical Co., Ltd., is **Mr R. D. Lee,** who has spent 21 years in the electrical industry. He served his apprenticeship with Edmundsons Electricity Corporation Ltd. Mr Lee had a distinguished war record in the Navy—he was awarded the B.E.M.

It is announced by E.M.I. Suppliers Ltd. that **Mr Kenneth Moore** has now been appointed manager of their Trade Division, in succession to **Mr N. LeGassicke,** who has left the company to take up an important appointment in the U.S.A. Mr Moore has been an executive in the company for some time past. From 1932 to 1941 he was connected with the electric lamp industry. Since 1945 he has devoted his activities to the promotion of sales in world markets in the electrical and engineering fields, having served as sales director on the board of a large engineering concern, and before taking up his present appointment was the export manager of Electronic Tubes Ltd.—an associated company of Electric and Musical Industries Ltd. Also newly appointed as assistant manager is **Mr Max H. Moss,** who has been a prominent personality in the Trade Division for a number of years. Prior to that he was in the export department of a radio manufacturing company.

Eight employees in the Electricity Supply Industry were presented with the British Empire Medal by the Rt Hon. Geoffrey Lloyd, on behalf of the Queen a few days ago. Our accompanying photograph shows the eight with Sir Henry Self, deputy chairman (administration) of the C.E.A. In the back row (left to right) are: Mr G. H. Tanner (South Eastern Board); Mr R. E. G. Simcox (North Western Board); Mr T. H. Hobkirk, (North Eastern Board); and Mr A. Frost (North Eastern Division). Front row (left to right) are: Mr H. S. Smith (Midlands Division); Mr D. B. Nicholson (Yorkshire Board); Sir Henry Self; Mr F. W. Matthews (London Division); and Mr F. Dowell (who is with the East Midlands Division, of C.E.A.)

Sir Henry Self with the British Empire Medallists

The North of Scotland Hydro-Electric Board have made two new appointments to fill the vacancy of chief hydraulic and civil engineer previously held by **Mr A. A. Fulton,** now general manager of the Board. **Mr L. H. Dickerson,** M.INST.C.E., A.M.I.W.E., has been appointed chief civil engineer, and **Mr P. L. Aitken,** B.SC., A.M.INST.C.E., becomes chief hydraulic engineer. Mr Dickerson, who was born in Greenwich, was educated at the City and Guilds College, London. He was employed by Balfour Beatty and Co., Ltd., on the early investigations of the Grampian hydro-electric scheme before serving as assistant engineer on the first stage of the Lochaber scheme. He was later engaged on the design and construction of all sections of the Grampian works and on completion of construction, he continued as engineer in charge of maintenance until joining the Board in 1948. Lately, he has been chief assistant to Mr Fulton. Mr Dickerson is past chairman of the Edinburgh and East of Scotland Association of the Institution of Civil Engineers. Mr Aitken, who was born in Aberdeen, was educated at Morgan Academy, Dundee, and at St. Andrew's University. He trained under the city engineer of Dundee, before taking up an appointment with the borough engineer of Derby. During the war, Mr Aitken served in the Royal Engineers from 1939 to 1946 and held the rank of Major. He joined the staff of the Board in 1946.

Of the five members of the new National Council for awards in technology, announced by Sir David Eccles, Minister of Education, three are already well known in the Electrical Industry. They are **Sir Harold Roxbee Cox,** KT., PH.D., D.I.C., D.SC., M.I.MECH.E., F.R.AE.S., F.INST.F., a director of the Brush Group, who was formerly chief scientist to the Ministry of Fuel and Power; **Dr Willis Jackson,** D.SC., D.PHIL., M.I.E.E., F.R.S.,

Mr J. D. Peattie

Mr G. W. Wheaton

Mr H. D. Green

director of research and education, Metropolitan-Vickers Electrical Co., Ltd., and **Dr Idris Jones,** C.B.E., B.SC., PH.D., F.R.I.C., M.I.MIN.E., F.INST.F., director-general, Scientific Department, National Coal Board. Among the 27 members of the Board of Studies in Engineering are: **Dr E. C. Smith,** B.SC.(ENG.), PH.D., A.M.INST.C.E., A.M.I.MECH.E., A.M.I.E.E., M.I.MIN.E., principal, Wigan and District Mining and Technical College; **Dr J. S. Tait,** PH.D., B.SC., A.R.T.C., M.I.E.E., A.M.I.MECH.E., principal, Woolwich Polytechnic; **Mr S. E. Goodall,** M.SC., M.I.E.E., chief engineer, W. T. Henley's Telegraph Works Co., Ltd., who represents the I.E.E. with **Mr G. S. C. Lucas,** O.B.E., M.I.E.E., director and chief electrical engineer, British Thomson-Houston Co., Ltd.; **Sir Walter Puckey,** F.I.I.A. (representing the Institution of Production Engineers), while representing the Minister of Education are: **Mr T. E. Goldup,** C.B.E., M.I.E.E., director, Mullard Ltd.; **Mr J. J. Gracie,** C.B.E., HON.A.C.T. (B'HAM), M.I.E.E., F.I.I.A., director, General Electric Co., Ltd.; and **Dr T. E. Allibone,** D.SC., F.R.S. Included in the 25 members of the Board of Studies in Technologies other than Engineering are: **Prof F. A. Vick,** O.B.E., B.S., PH.D., A.M.I.E.E., F.INST.P., of University College of North Staffs (representing the Institute of Physics); **Mr W. A. Cook,** B.SC., M.I.E.E., F.P.I., of the Plastics Institute; while **Mr G. A. Whipple,** M.A., M.I.E.E., F.INST.P., of Hilger and Watts Ltd., and **Dr F. Kidd,** C.B.E., F.R.S., D.SC., of the Department of Scientific and Industrial Research, are among those representing the Minister of Education.

Mr T. M. Marsden, works superintendent with South Shields Corporation transport undertaking, has resigned to take a new position as deputy manager and engineer of the Bournemouth Corporation Transport Department.

The Marconi International Marine Communication Co., Ltd., have appointed **Mr J. H. C. Dalziel** as manager of their Karachi depot in succession to **Mr T. Moriarty,** who is returning to the U.K. for leave prior to reappointment, having completed his tour of duty in Pakistan.

Mr A. Paterson, assistant works manager at Trafford Park, is leader of a small party of experts from the Metropolitan-Vickers Electrical Co., Ltd., which left England for India last week to advise the Indian Government on the setting up of a heavy electrical manufacturing industry. Another member of the party, **Mr F. Bateman,** of Metropolitan-Vickers, is to study the question of setting up training schemes. They are members of the team picked by A.E.I. Ltd. for the task.

As from 1 Jan. next, **Mr A. F. Holt,** A.M.INST.C.E., borough engineer of Croydon, is taking over the responsibility for street lighting on behalf of the Corporation.

Newly-elected chairman of the Junior Institution of Engineers is **Mr J. C. Y. Baker,** A.R.A.E.S. The new vice-chairmen are **Mr J. E. Gray** and **Mr R. Whitehead.**

In celebration of his 90th birthday, **Mr Frank Christy,** M.I.E.E., founder of Christy Bros. Ltd., of Chelmsford, was the guest of honour at a party on Saturday last, which was attended by 300 employees, their relatives and friends. To mark the occasion Mr Christy was presented with an illuminated address by **Mr A. A. Gates,** chairman of the company, and he afterwards cut a massive birthday cake bearing 90 candles.

The Central Electricity Authority announces that **Mr J. D. Peattie,** B.SC., F.C.G.I., M.I.E.E., has been appointed acting chief engineer as from 1 Jan. to succeed **Mr V. A. Pask,** O.B.E., M.I.E.E., M.I.MECH.E., who as we have already noted, retires at the end of this month. Mr Peattie became deputy chief engineer (generation) to the Authority in 1948, following the death of Mr R. R. Martindale. He had joined the Authority in the previous year as deputy chief engineer (transmission) after being deputy chief engineer to the Central Electricity Board for three years. A native of Dundee, where he received early training, Mr Peattie spent three years with Siemens Schuckertwerke, Berlin, where he was engaged on high voltage d.c. research, and subsequently held appointments with the Metropolitan-Vickers Electrical Co., Ltd., at Trafford Park, Edminston Brown and Co., Ltd., and the Manchester Corporation Electricity Department, before joining the C.E.B. in 1929 as operation engineer at headquarters. Mr Peattie has been responsible for much pioneering work in the development of the National Grid system, notably with the forward planning of generating capacity expansion, and also in connection with the output from all public stations and of the inter-connected grid. He has written several important papers on aspects of the Supply Industry, and that on "The British Grid System in War-Time," in collaboration with Sir John Hacking in 1947, gained him the Llewellyn B. Atkinson Premium of the I.E.E. He is a member of the Council of the I.E.E., and was chairman of the Supply Section in the 1954/55 session. He has also served on numerous important committees.

British Insulated Callender's Cables Ltd. have appointed **Mr G. W. Wheaton,** B.SC., as branch manager at Middlesbrough in succession to **Mr R. N. Crawford,** who is retiring. The appointment takes effect from 1 Jan. Mr Wheaton studied metallurgical aspects of public construction work with Mr A. E. Tucker, F.I.C., and later was employed by H. W. Lindop and Sons, Ltd., of Walsall, and the B.S.A. Co., at Birmingham. He joined the Royal Navy in 1940 and served for six years as an officer in the Submarine Service. On his demobilisation in 1946 he joined British Insulated Callender's Cables Ltd., and was assistant superintendent of the Wire Drawing Department of the company's Prescot works until 1954, when he joined the Home Sales department and was appointed to the Middlesbrough sales office.

Mr H. D. Green has been appointed sales engineer in the Midlands area for Tricity Cookers Ltd. He is well known throughout the trade in the Midlands area, and was previously with Wilkins and Mitchell Ltd.

Mr Ernest Long, F.C.I.S., secretary to the Central Electricity Authority, has been elected honorary treasurer of the Chartered Institute of Secretaries.

Mr J. Sorrell, director of Max Stone (J. and M. Stone) and of Stores Trust, has now been appointed managing director of the companies.

OBITUARY

Mr F. H. Rogers, M.I.MECH.E., a director of the British Vacuum Cleaner and Engineering Co., and of Stream Line Filters Ltd., has died, aged 78.

Mr N. Blackett, who retired some time ago because of ill-health, from his post as district engineer at Crook to the North Eastern Electricity Board, has died, aged 58.

Mr Leslie W. Hare, of the Birmingham office of Lancashire Dynamo, died on 4 Dec. aged 59. Educated at Brentwood Grammar School, he served an apprenticeship with Crompton and Co., and was with the Kohler Co. before joining L.D.C. in 1926. He had been at the company's Birmingham office for 26 years, and was a member of the Birmingham, Worcester and Coventry Electricity Clubs.

PROBLEMS AND PRACTICE

In Engineering

Every engineer has a story to tell; why not tell yours on this page? We welcome contributions to this feature, and those published will be paid for at our standard rates. Problems which are encountered and overcome in day-to-day maintenance or installation of electrical plant; useful methods and techniques developed for specific jobs, or current practices, all make instructive reading for others. We will also consider for publication problems requiring an answer. Sketches are often helpful and need only be rough, as they will be redrawn before use.

Paralleling Alternators

THIS factory generates its own power, at 400 V, 3-phase, and is engaged in seasonal production. During the off-season, which is devoted mainly to overhaul and repairs, the load is light and was normally catered for by a 100 h.p. diesel generator. Eventually, however, the off-season load increased beyond this capacity and a second diesel, of 350 h.p. was installed, the original one being kept for times of light load. The 350 h.p. machine carried the load comfortably but the time came when this engine also became overloaded for periods and it was then necessary to put the old 100 h.p. on load also.

There were two possibilities, of which one was to divide the load between the machines in proportion to their capacities. This meant splitting the switchboard and entailed a good deal of temporary connections. Another disadvantage was that to increase or decrease load on a machine meant an electrician changing cables and the like.

The other alternative was to run the two sets in parallel. While the new set had a direct coupled generator, running at 500 r.p.m. with a very efficient governor, the old set employed a belt drive, the engine running at 500 r.p.m. with the generator at 1,000 r.p.m., whilst its governor was erratic on fluctuating loads. For these reasons it was feared that it might not be possible to keep them in parallel, but it was worth a trial.

Synchronising lamps were installed and the smaller set was started up. Both engines was adjusted to 500 r.p.m. according to their rev. counters but were so much out of synchronism, that it was hardly possible to see any dark periods in the lamps. Suspecting that the rev. counter on the old set might not be reading accurately the engine was slowly brought up to 550 r.p.m. This improved matters and awaiting a fairly steady period on the lamps the set was switched in. Immediately it was noticed that the load on the running machine had increased while the wattmeter of the incoming machine was trying to read backward showing that the record set was motoring. Hastily decreasing the revs. of the big machine rectified matters and the incoming machine was picking up load nicely when suddenly the machines started hunting, the meter needles swinging back and forwards at an alarming rate. The situation seemed to be getting out of hand when it was discovered that the belt on the smaller set was slipping. Some "belt-stick" cured this problem and everything was going smoothly except for two strange features. With the loads evenly balanced between the two sets, the 350 h.p. appeared to be running at only 450 r.p.m. while the other was showing 500 r.p.m. and the exciter ammeter on the big set indicated overload whilst the other showed very little current.

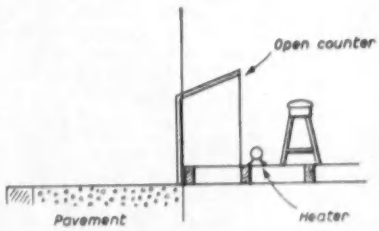
Adjusting the automatic voltage regulators evened out the latter disparity but now the voltmeter on the big set indicated about 380 V while the other had 400 V. Getting a portable voltmeter and tachometer soon cleared up this matter. It was found that both the voltmeter and rev. counter on the big set were reading low. The voltmeter was adjusted there and then and the rev. counter was returned to the makers for inspection.

The two sets then teamed up satisfactorily giving a good reserve of power. There was no trouble in keeping them in parallel even with a fluctuating load and with the experience gained there was no difficulty in paralleling afterwards.—*G. B.*

Negatived Shopping

SHOP window displays especially at Christmas are all set to attract the customer. The following two electrical faults tended to reverse the magnetic appeal of the goods on view.

First instance concerned a small shop with counter parallel to the pavement. Road conditions were slushy at the time fault was reported. Handing change to an early customer both shopkeeper and customer had received a little extra in the nature of a shock. The shopkeeper stated her feet were resting on a tubular heater behind the counter when the incident occurred. As the supply to heater was taken from a two pin socket the fault had passed undetected till then. Furthermore, the shopkeeper had removed her shoes in order to warm her feet, chilled en route to the shop.



Arrangement of heater installation behind counter

In the second shop, a prospective customer while window gazing had placed his hand on the wooden bottle-facing framing the window, and found he was linked up with an electrical circuit. A faulty outside lighting fitting improperly earthed, was the offender in this case.

The fitting projected over a lead flashing above the window. This flashing made contact with a decorative gilt line centred on the bottle facing. Heavy rain assisted the leakage via flashing and the gilt line thus became live. Corrective measures, needless to say, were employed to prevent a re-occurrence of both complaints.—*R. W. B.*

Plumber Gets Shock

REPAIRS were being carried out to a water pipe. The plumber, on putting a new length of pipe in, received a severe shock when he came in contact with a section of the water pipe which came from the house. On investigation, it was found that a fault to earth had occurred on an iron which the consumer must have plugged in just about the time the plumber came in contact with the water pipe from the house. As the socket-outlet into which the iron was plugged relied on the water pipe for its earth, which when not joined to the main water pipe outside was of high resistivity, the pipe therefore became alive and the fuse did not blow.

Incidentally, the repairs to the water pipe were held up until the arrival of the electrician who put things in order, although the consumer had disconnected the iron when she found it was not working. The above fault could have had disastrous effects in more ways than one, as the water tap in the house and other metal work, would be alive to earth.—*A. Dearden.*

Joining Chains

I WAS interested in Mr C. T. Bower's idea (24 Nov. issue) for facilitating replacement of a connecting link in a roller driving chain. I have found that this operation can often be accomplished single-handed by wrapping the chain around its sprockets with the joint at approximately the mid point of that part of the circumference of the wheel with which the chain is normally in contact. So long as the chain is not too heavy and this can be done the ends are held conveniently in position and the connecting link can be fitted with no trouble. Incidentally it does not seem to be universally known that the closed end of the spring clip connecting link should be fitted so that it faces in the normal direction of chain rotation.—*"Ubique."*

Equipment for Industry

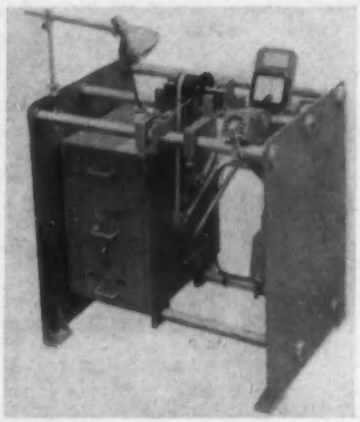
Switching Night Tariff Supplies

CONCERNS taking advantage of "off peak" tariffs for heating premises have been offered a new range of automatic control equipment to facilitate installation switching at predetermined times within the period specified by the particular Electricity Board. Available in four ratings from 30 to 150 amps, the units manufactured by ENGEL AND GIBBS LTD., Warwick Rd., Boreham Wood, Herts, are based on one design with the supply company's and customer's controls separated in a two compartment sheet metal box. The bottom section containing master time switch and main contactor may be locked and the equipment adjusted only by the supply company. The top compartment houses the controls accessible to the customer and includes a time switch which may be set for the installation's requirements during any period within the time allotted for reduced tariff. Internal wiring has been colour-coded in accordance with I.E.E. regulations and the case will be finished in a grey hammer enamel unless otherwise requested.

Engel and Gibbs' automatic control equipment for "off peak" installations

Balancing Rotating Components

ROTATING components weighing a few ounces to one hundredweight may be accurately balanced by means of a new electronic equipment incorporating a number of refinements. Operating on the principle of converting vibrations produced by a rotating unbalanced specimen to a voltage varying in frequency with the degree of vibration, the machine developed by SMALL ELECTRIC MOTORS LTD., Beckenham, Kent, merges much of the experience gained by this concern from their own motors and generators.



This dynamic balancing machine includes automatic tuned circuits compensating for mains frequency fluctuations

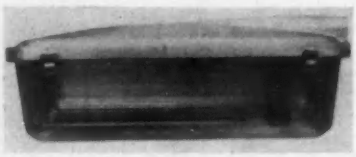
With the test component rotating at 2,000 r.p.m., a bearing displacement to within 25 millionths of an inch may be measured, closer tolerances are claimed with higher test speeds.

Tuned electronic amplifiers are fed from moving coil transducers supplying the variable voltage, the resultant signal indicating the degree of unbalance on a calibrated meter. To avoid inconsistent readings due to mains frequency fluctuations, an automatic tuning apparatus, consisting essentially of a Wien bridge and servo-motor actuating gauged logarithmic potentiomenters, compensates the tuned amplifier circuits in accordance with the mains frequency variations. Stabilised by the same means, a stroboscopic circuit triggers a lamp flashing in phase with the rotating test component enabling the position of unbalance to be seen. Measuring equipment and drive mechanism are mounted on a solidly constructed frame to reduce ground vibrations which often produce spurious readings with equipment of this type.

New Sodium Lantern Range

SUPPLEMENTING their range of street-lighting fittings, A. C. FORD LTD., Pear Tree Lane, Dudley, Worcs, now offer their first lantern for sodium lighting which is for 140 W lamps. Known as AC.480, it is the first of a range of lanterns catering for all sizes of sodium lamps from 45 W and arranged for different types of mounting.

The newcomer is a totally enclosed type, employing a "Perspex" bowl attached to a cast silicon/aluminium body. Light distribution is primarily controlled by "Perspex" refractor plates



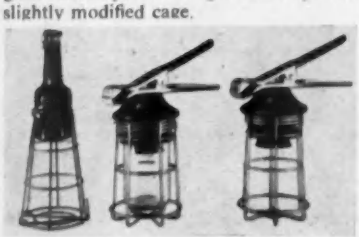
The A.C. 480, forerunner of A.C. Ford's new sodium lighting lanterns

hermetically sealed to the sides of the bowl to give a wide angle beam having a maximum intensity at 80° from the vertical. An anodised aluminium reflector, however, is also fitted in the lantern. With a directional ratio of 1·96, and output ratio of 0·9, the light output of the lamp in the lower hemisphere is 7,200 lumens, whilst 12% of the total light output is transmitted above the horizontal.

Internally, the lampholder, which is secured to the lamp support bracket by set pins and locknuts, is wired in asbestos covered cable to a separate connector block, a separate earth terminal also being provided. Access to the interior is readily gained by releasing quick action toggle clips on one side of the bowl, which then swings down on its hinge on the other side. To preclude the entry of dust and water, a felt gasket is fitted between body and bowl, whilst moisture collecting in the column bracket is also excluded.

Nettle's New Handlamps

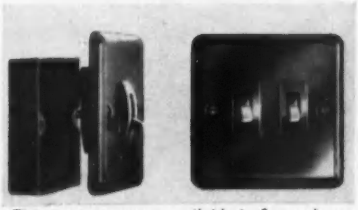
THREE new inspection handlamps have been added to the list of ancillary equipment available from NETTLE ACCESSORIES LTD., Harper Rd., Wythenshawe, Manchester. The first, type 230, is robustly constructed, having a rubber handle and suitable for use with a lamp rated up to 60 W guarded by a wire cage. The two latter types, L38, and L39, have been designed for heavy duty incorporating sturdy cages, rubber bodies and clip-on handles. Both types appear similar, but L39 is waterproof when fitted with a glass envelope covering the lamp and slightly modified cage.



These inspection handlamps are designated 230, L39, L38

New Nettle Flush Switch

COMPLETELY new flush moulded combined switch and plate has been introduced by NETTLE ACCESSORIES LTD., Harper Rd, Wythenshawe, Manchester 22. The new accessory has fixing centres at 2¼ in. so that it can be used on any box from ⅛ in. deep having fixing centres to B.S.S. 1299. This unit is available in brown, white, cream and ivory. List



This new accessory available in four colours

prices are as follows: 1 gang 1 way, brown, 30s. 8d. per doz.; other colours 35s. per doz. 1 gang 2 way, brown, 41s. per doz.; other colours 44s. 8d. per doz. 2 gang 1 or 2 way, in brown, 67s. 4d. per doz.; in other colours 72s. per doz.

Interchangeable Colour Scheme feature of New Prestcold D361

NEW colour schemes are introduced in the Prestcold refrigeration range with the announcement of a new Model D361 by the PRESSED STEEL COMPANY LTD., Cowley, Oxford.

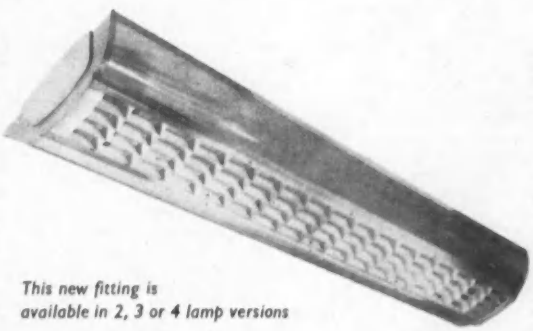
Under this Colour Choice scheme the cabinets are available in either white or cream, with a choice of six vitreous enamel table tops in star white, cascade cream, matador red, midnight black, ice blue and crystal green and four bases in the same range of colours (excluding white and cream). These bases in colour are in unbreakable polythene particularly well suited to withstand hard usage in this vulnerable position. Prestcold emphasise the flexibility of this colour choice idea in matching with contemporary kitchen décor. *Users will be able to change colour tops and bases at a later date at a reasonable cost to match in with changed kitchen schemes.*

Unusual is the finger light "Prestalok" incorporating the Prestcold motive. This semi-recessed idea is a considerable advance on the conventional projecting handle. It embodies nylon to metal bearing surfaces to assure quiet operation and makes lubrication unnecessary. It includes a locking device. An important consideration in restricted space—the door opens within cabinet width.

Dimensions are 3·6 cu ft net capacity; 36 in. height, 37¼ in. over spill guard; width 22¼ in.; and depth 22 in. overall. A new design of wide frozen food locker, 6½ lb capacity, has room for extra large dishes, ring mould or two ice trays side by side. An eighteen-cube aluminium, an extra large chill tray in matching plastic, two zinc plated ice blue high bake enamel cabinet shelves and two ice blue plastic door shelves are additional features. Price £74. 13s. 5d. inc. purchase tax.

Siemens F.T.F. 5742 a "design-wise" fitting

RECENT addition to the wide range fittings available from SIEMENS ELECTRIC LAMPS AND SUPPLIES LTD., 38, 39 Upper Thames St, E.C.4, the F.T.F. 5742 houses two 5 ft. 80 W, fluorescent lamps, and provides a high degree of overall illumination. The fitting is manufactured in best quality silver sheet steel bonderised and finished in Siemens super-hard "Haligloss" stove enamel (two tone bronze), or to order in any other B.S. approved shade. Instant start or switch start (tapped) control gear incorporating the high efficiency 2-pin canister-type starter, S.T.A. 26—is housed within a closed channel inside the fitting. Removal of snap-on metal covers renders the control gear readily accessible. Side screens are of reeded "Perspex" and the metal louvre (3 to 1) is finished in white "Haligloss." Glass or clear "Perspex" dust covers are available if required. This fitting which is designed for chain or down-rod suspension is available as a 3-lamp unit (F.T.F. 5743) and as a 4 lamp (F.T.F. 5744) with dimensions identical with F.T.F. 5742 as follows: Overall length 5 ft 5¼ in., depth 5¼ in. (inc. suspension brackets 7 in.), overall width 40 in. (14 in. fixing centres). The firm has also introduced a range of clip-on diffusers which we hope will be described in our next issue.



This new fitting is available in 2, 3 or 4 lamp versions

For the Electrical Trade

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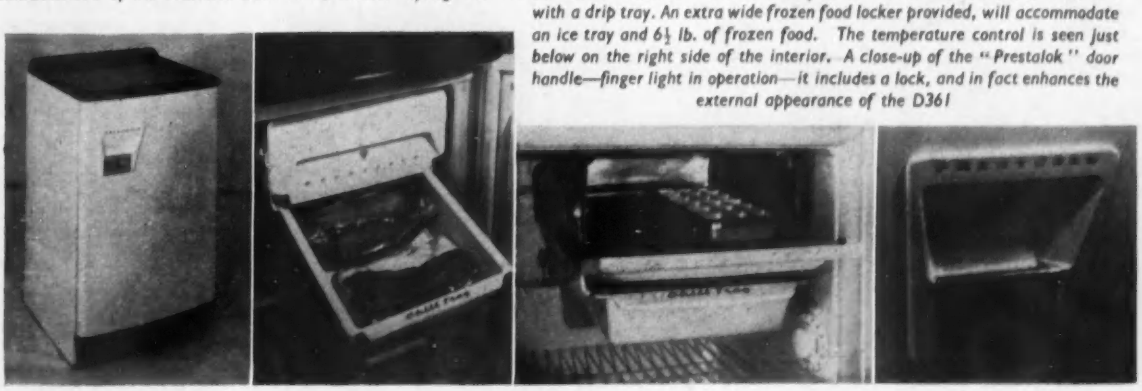
Price Changes

PHILIPS ELECTRICAL LTD., Century House, Shaftesbury Ave, W.C.2; BRITISH NATIONAL ELECTRICS LTD., Newarthill, Motherwell, Scotland; BARCLAY AND SONS LTD. (Paladin Division), 28 Old Brompton Rd, S.W.7, Premier Electric Heaters Division of HOTPOINT, and EASICLENE PORCELAIN - ENAMEL (1938) LTD., Darlaston, Staffs, have informed us of new prices for products (affected by the purchase tax increases) which are being notified to the trade. The latter company's letter concerned the EW1 washing machine now £27. 11s. 5d. plus £11. 4s. 3d. p. tax and their refrigerator now £38. 11s. 5d. plus £18. 10s. 4d. p. tax. DIMPLEX LTD.,

Characteristic of the Prestcold D361 is its smooth styling and the two-colour scheme. The chill tray in the second illustration is combined with a drip tray. An extra wide frozen food locker provided, will accommodate an ice tray and 6½ lb. of frozen food. The temperature control is seen just below on the right side of the interior. A close-up of the "Prestalok" door handle—finger light in operation—it includes a lock, and in fact enhances the external appearance of the D361



Totton, Southampton, have now issued revised price lists for their range of products to take into account recent price changes. Prices now range from £13. 13s. 3d. to £35. 5s. inclusive of p. tax for the oil-filled radiators, towel rails, from £1. 7s. 6d. to £3. 7s. (inc. tax) and caster wheels, price £1. 11s. 8d. per set tax paid.

As from 1 Dec., 1955, the prices of industrial tungsten filament lighting fittings, certain fluorescent lighting fittings and items of control gear have been slightly increased, according to an announcement by the Atlas Lighting Division of THORN ELECTRICAL INDUSTRIES LTD., 233 Shaftesbury Ave., W.C.2.

Stella Fluorescent Lighting Soon

ENTRY into the fluorescent lighting fittings market has been announced by the STELLA LAMP COMPANY LTD., 37-39 Oxford St., W.1, with the publication of a four-page two-colour leaflet describing the first of the "Blue Label" range. This includes ceiling batten, ceiling vee, industrial trough, slotted light, trough and angle reflector fittings. All are distinguished by a form of guarantee in the shape of a blue label. The range will be described in our next issue.

Field's New Low Price Batten Fitting

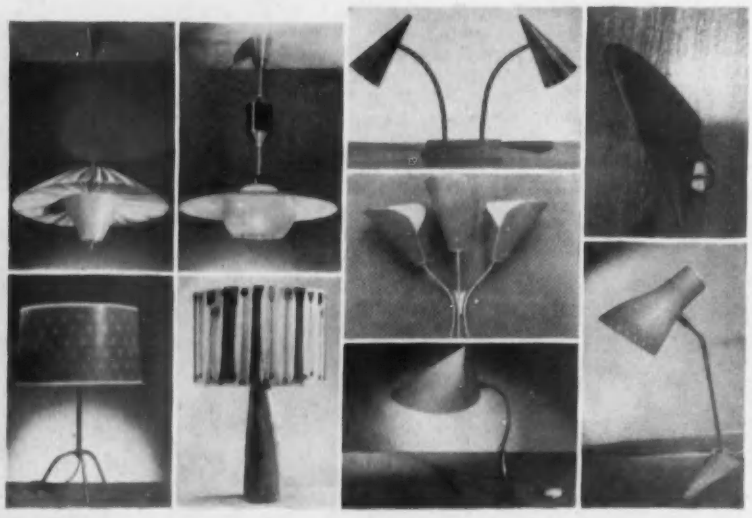
AN attractive low price fitting has been marketed this week by H. W. FIELD AND SON LTD., Harold Wood, Essex. They say that it is a really silent batten fitting which conforms with B.S. 2467/1954, and utilises a ballast which again is manufactured to B.S. and relevant draft B.S. specifications (B.S.S. 171/1936 and Draft B.S. Co. (LGE) 919-1955 relating to maximum heat, rise, watts losses and noise level), and is covered by the firm's "everlasting ballast" guarantee.

All steel, this fitting is finished in white stove enamel, and packed in a neat carton ready for connection to supply mains. For 200/210 V; 220/230 V; 230/240 V; and 240/250 V supplies, the fitting is available in four models: 5/POP for 5 ft, 80 W, lamp, £4. 2s.; 4/POP for 4 ft, 40 W, lamp, £3. 9s.; 3/POP for 3 ft, 30 W, £3. 9s., and 2/POP for 2 ft, 20 W, for £3. 3s.

Available in four models this new low price batten fitting is from H. W. Field

New Designs from Oswald Hollman

These attractive fittings are among many new designs just added to the range of lighting equipment available from Oswald Hollman Ltd., 208 Kent House Rd, Beckenham, Kent. In the first column the top pendant-fitting No. 1488 has brass stem and aluminium ceiling rose with multi-coloured plastic skirt-shade over champagne or white glass diffuser. The table lamp below 3143 is a polished brass tripod rod stem with parchment shade (4011) 13 in. diameter sprayed in various contemporary colours. In the second column the ceiling pendant fitting has a polished brass rise and fall with skirt shade and diffuser in white or champagne glass. The "Bollard" with base in mahogany has a taffeta shade with Lucienne Day design No. 3113 shade 4222. The desk fitting has twin flexible arms with conical shade in polished brass and base in mahogany or beech (3313). The three-light fitting in the centre is in satin brass (2398). The coloured buckram shades have gold star motifs (7961). Base No. 3399 in the table lamp has a satin brass stem with a bipod attachment which can be painted in different colours. The rayon cone shade (7102) is in various colours. The wall fitting in the fourth column has aluminium spun cone perforated and painted any colour with back plate and stem in polished brass (2389) No. 3312 is an attractive table lamp with satin brass rod, coloured aluminium perforated shade and bipod foot in beech or mahogany. Prices, including tax, are as follows : 1488, £3. 11s. 9d. ; 1383 1486 £5. 11s. 3d. ; 3143/4011/13 in. £4. 11s. 3d.; 3113/4222 13 in. £3. 12s. 9d.; 3312 £7. 19s. 6d.; 3313 £11. 4s. 0d.; 3399/7102 £4. 6s. 5d. ; 2389 £2. 17s. 5d. ; 2398/3 ft./7961 £8. 12s. 1d.



TRADE PUBLICATIONS

TRUCKS.—Four new Bulletins (B1176, 1076, 1107, 1163) have been published by the Yale and Towne Manufacturing Co., British Materials Handling Division, Wednesfield, Staffs, dealing with the four Duplex telescoping lift electric "Worksaver" trucks which they produce.

ACCESSORIES.—Recent issue of the "Wylex Armchair," from Geo. H. Scholes Ltd., Wylex Works, Wythenshawe, Manchester, features the Wylex switch fuse control unit which is supplied in any combination of 5, 15 and 30 amp fuses.

INSULATION.—The special application to the electrical industry of Polytetrafluoroethylene (P.T.F.E.) are discussed in a new brochure issued by the Dunlop Rubber Co., Ltd., General Rubber Goods Division, Cambridge St, Manchester 1.

LIGHTING.—New folder produced by the Benjamin Electric Ltd., Brantwood Rd., Tottenham, London, N.17, gives full information on the Flurolier continuous channelling system for fluorescent lighting.

LIGHTING.—The Lighting Division of Philips Electrical Ltd. have published a new four-page, two-colour leaflet which deals with the Philips continuous adaptable lighting system (P-CALS).

WELDING.—Following the amalgamation of the activities of the Quasi-Arc Co., Ltd., and Fusarc Ltd., a new comprehensive catalogue (T.C. 845) has now been issued by Quasi-Arc Ltd., of Bilston, Staffordshire, giving details of manual and automatic welding equipment.

MILL ELECTRIFICATION.—New addition to the series of B.T.H. Lecture Service publications is a booklet on the conversion of cotton spinning mills from steam to electric drive by S. Birchall, ASSOC.M.C.T., A.M.I.E.E., written by an engineer with a lifetime's experience in this sphere. The booklet will be sent free of charge to any mill owner or engineer who writes (on business letter head) to the Publicity Department (Mgr.), Rugby.

MOTOR CONTROL GEAR.—New Lists No. 365 motor control gear catalogue is available from the Midland Electric Manufacturing Co., Ltd., Tyseley, Birmingham 11.

NEWS OF THE WEEK

Record Spending on Press Ads

Advertising Electrical Appliances in July-Sept. Quarter follows Rising Trend

LATEST figures, issued last week, on expenditure on Press advertising during the July-Sept. quarter of this year, show remarkable increases. In fact, spending in respect of all types of goods and services is up by over £4m on the corresponding months in 1954, and sets a new record for a three-month period. This trend is the more remarkable because the quarter under review covers the traditional holiday period and may be reasonably regarded as the slackest advertising time. The same large increase in advertising expenditure is recorded in respect of domestic electrical appliances in particular. Figures quoted in that connection reveal that over twice as much money was spent in promoting sales of these goods as in the same quarter last year. Expenditure on the part of almost all individual manufacturers in this group rose proportionally. Although the basis of compiling these figures may be open to some criticism, and doubt as to accuracy, they would nevertheless provide an indication of the general trend. Nine-monthly totals covering the months from Jan. to Sept. provide added evidence of greater spending on Press advertisements.

Figures relating to the nationalised electricity supply industry do not show such large increases, but are nevertheless remarkable. Expenditure by the E.D.A. and the Electricity Boards are up, but the totals attributed to the C.E.A. individually, record a big drop. This, no doubt, reflects the Authority's voluntary cut in advertising expenditure which became operative in the middle of the quarter reviewed.

Commonwealth and Sterling Area Trade

PUBLISHED last Monday by the Board of Trade, was the 75th edition of the Statistical Abstract for the Commonwealth and Sterling Area. It brings into one volume the basic trade statistics of Commonwealth countries up to 1954. As well as analysing imports and exports from each country, tables have been compiled showing the important aspects of trade and related subjects. Trade figures give a good indication of how sterling area countries have progressed in different countries, especially in dollar markets. For industrial countries full details of trading partners are given for the years 1951-54, and these are also grouped to show the trade of each with other sterling nations, O.E.E.C. countries and similar groups. The Standard International Trade Classification has been used in compiling figures on individual commodities in respect of 26 Commonwealth countries. Comparison of the pattern of trade between various countries has thus been made much simpler. The commodity tables also provide information on suppliers and markets for important groups.

New British Company in Central Africa

MORE evidence of the electrical importance of Central Africa is provided by the announcement last week that the British Thomson-Houston have formed a new company with offices in Salisbury, Bulawayo and N'dola. The company will be known as the British Thomson-Houston Co. Central Africa (Private) Ltd., with Mr K. C. Ford as general manager. Mr Ford has spent a number of years as the B.T.H. regional representative out there and is well known in Rhodesian engineering circles. With him on the Board of Directors is Mr G. R. A. Fletcher, of Johnson and Fletcher. The company will be staffed by B.T.H.-trained engineers, nearly all of whom have had some years' experience in Africa.

ELECTRONICS CONFERENCE IN GLASGOW NEXT FEBRUARY

THE conference on Electronics in Industry, being planned in the South of Scotland, will take place at the Kelvin Hall, Glasgow, between 2 and 10 Feb., it has been announced. The actual conference will extend over the whole period, but the coincidental exhibition will be staged from 6 to 9 Feb. Further details of the conference are expected to be announced very soon.

This conference and exhibition was first suggested last May, and reported in these columns on 26 May. Glasgow area manager of the S. of Scotland Electricity Board, Mr A. Kelso, made the proposal at a conference of Scottish Productivity Committees. The relationship between electronics and productivity was the suggested subject, and Edinburgh the venue, and the idea was received so enthusiastically that arrangements began almost immediately.

Private Trader Seeks Proof of Quality

PROMPTED by the claim of Electricity Boards that all appliances sold by them have been tested and are safe for use, private traders have inaugurated a similar system of guarantee. For some months now members of the Electrical Appliance Dealers' Assoc. have been following a plan to raise the standard of goods sold, and encouraged to offer only those articles which bear the Seal of Guarantee of the Good Housekeeping Inst. Now, a distinctive window sign has been issued stating that the retailer is a member of the Assoc. and supports the scheme. Any manufacturer can submit an article to the Inst. for testing, but the Seal is awarded only on merit. We understand that tests are likely to take some months as appliances undergo practical trials, laboratory and technical tests, and also tests for compliance with safety and other standards. Regular lists of appliances tested are issued to traders.

E.D.A. LUNCH

ANNUAL luncheon of the E.D.A. will take place at the Savoy Hotel, London, on 24 Apr. next, it has been announced. The annual general meeting will be held immediately afterwards.

Halifax Hospital consider Electric Blanket Death

THE death of a 4-day-old baby due to the use of an electric heating pad in the maternity department of Halifax General Hospital, has been considered at a meeting of the Halifax Area Hospitals' Management Committee. At the inquest (see our 10 Nov. issue) a verdict of accidental death was recorded and the coroner commented that the whole question of the method and use of electric heating pads should be considered. A committee of inquiry was set up after the inquest, and reported that shortage of staff necessitating the employment of inexperienced staff, lack of adequate basic facilities, failure of the thermostat on the pad, and confusion of the pad with the cot mattress, were all responsible for the accident. The Management Committee adopted recommendations for the future use of electric heating pads, including the regulation that pads are only to be used under trained nurse supervision. In addition, the pads will have to comply with rigid specifications and receive regular inspections. Steps are to be taken also to see that student nurses and others receive adequate instruction in their use.

Electrical Exhibition Planned in Tanganyika

DEVELOPMENT of electrical resources in East Africa has led to a number of steps designed to encourage people there to use electricity and buy more electrical appliances. Following our note some weeks ago of Uganda's efforts with radio and electrical exhibitions and similar activities, we hear that action is also being taken in Tanganyika now that a new 20 kW radio transmitter is providing the country wide coverage. In order to stimulate sales of radios, it is proposed to hold an Exhibition of Radio and Electrical Appliances at Dar-es-Salaam over the Easter holidays next year. Arrangements are being made by the Social Development Dept. and a committee of representatives of commercial firms. Venue will be the Cameron Rd school. It is also proposed that a section of the exhibition will be specially devoted to electrical contractors. Plans are also being discussed at present concerning the formation of Tanganyika Radio and Electrical Dealers' Assoc., a move similar to that suggested in Uganda.

Plans for Engineering Training in Britain

EDUCATION and training of engineers features in two announcements made last week. The first takes the form of a report from the Government's Committee on Scientific Manpower, while the other is a statement by the Minister of Education of the membership of the new National Council for Awards in Technology.

The report deals with certain problems affecting the recruitment by industry of graduates and apprentices. It states that fear exists among manufacturing concerns that the expansion of higher technological education and research by universities is detrimental to engineering, because men who go to the universities to take engineering tend to stay there too long, with little advantage to industry. There is also some fear that men who might more usefully enter industry from school as apprentices go instead to the universities. The Committee does not confirm these fears. An important factor in its attitude is evidence that the universities are not yet producing more than about three-quarters of the graduates whom industry requires. The Committee does, however, feel that engineering is not attracting enough of the outstanding boys in some schools. Published by H.M.S.O., the report contains extracts from industrialists' views.

It had already been announced that Lord Hives was to be chairman of the new National Council. Now the names of the other five members appointed by the Minister of Education are announced. They are Sir Harold Roxbee Cox, Sir Arnold Hall, Dr Willis Jackson, Dr Idris Jones, and Mr E. L. Russell. The function of the Council is to award and adminster awards in technology which will have national recognition and which will be available to students in technical colleges who successfully complete courses approved by the Council. In addition to the Council, there will be two boards of studies consisting of nominees from various authorities. One will deal with engineering, and the other with technologies other than engineering. The membership of these has also been announced. The boards of studies will meet on 15 Dec. to elect representatives (three each) to the Council. The full Council will meet on 19 Dec.

There were many notable personalities among the 200 who attended the annual dinner of Ipswich Electrical Association last Friday. Included in our photograph are (left to right) Mr H. A .T. Simmonds, principal of Trent Park Training College; Ald C. G. Rushen, Mayor of Ipswich; Mr S. Hardy, chairman; Mr C. T. Melling, president, and chairman of the Eastern Electricity Board; Dr A. H. Morris, Bishop of St. Edmundsbury and Ipswich; Mr H. Hawkins, chief engineer, B.X. Plastics Ltd., and Mr E. G. Couzens, technical director of Bexford Ltd.

Tickets Available for 1955-56 Faraday Lecture

THIS session's Faraday Lecture on "Coal Mining Electrically" is now going the rounds of I.E.E. Centres. Next Thursday, Mr B. L. Metcalf's paper will be read in Nottingham's Albert Hall, and then in the New Year there will be a further eight deliveries beginning in Manchester on 17 Jan. and ending in Aberdeen on 29 Mar. Readers may be interested in the following advanced information on where they may obtain tickets.

Tickets for the Manchester lecture at the Free Trade Hall may be had from T. T. Evans, 9 Kingston Drive, Sale. Venue on 19 Jan. will be the Town Hall, Birmingham, and tickets are with E. H. Cox of M.E.B., Mucklow Hill, Halesowen. For the meeting at Southampton's Guildhall on 13 Feb. applications should be made to H. W. Housley, 15 Southdown Rd, E. Cosham, Portsmouth; and at the Central Hall, Westminster, on 15 Feb. to the I.E.E. headquarters. The City Halls in Sheffield and Newcastle are the venues on the 14 and 16 Mar., and tickets may be had from J. A. Walker, 154 Springfield Rd, Sheffield, and A. T. Crawford, 18 Rectory Terr, S. Gosforth, Newcastle. In Scotland, the lecture will be delivered at Glasgow's Bute Hall on 26 Mar., and at the Music Hall, Aberdeen; tickets from J. H. P. de Villiers, of Bruce Peebles, 19 Waterloo St, Glasgow.

Sulphuric Acid Production

WE wish to point out, that in the article on page 831 of last week's issue, the anhydrite should have been referred to as calcium sulphate, and not as stated.

A.S.E.E. GUIDE TO WIRING REGULATIONS

NEWLY published by the Association of Supervising Electrical Engineers is a cross reference index to the 13th edition of the I.E.E. Wiring Regulations, giving the number of the regulation in the new edition corresponding to each one in the 12th edition. There is also a brief survey of new and changed regulations. The index is intended mainly for members of the Association, but copies are offered to anyone in the industry. Application should be made to the General Secretary, A.S.E.E., 23 Bloomsbury Sq. London, W.C.1, and a 2½d. stamp enclosed.

OFFICIAL PUBLICATIONS

BRITISH STANDARDS: B.S.2612, 1955: Electrically Heated Blankets; B.S.2641, 1955: Glossary of Terms relating to Automatic Digital Computers.

Amendment Slips. P.D. 2326: Tungsten Filament General Service Electric Lamps, amending B.S. 161, 1940; P.D. 2317: 1948 Graphical Symbols for Telecommunication, Component Refs. Suppt. 1 to B.S. 530, 1948, and P.D. 2316: Lead/Acid Batteries (non-aerobatic) for aircraft, amending to B.S.26131, 1952.

STATISTICAL ABSTRACT FOR COMMONWEALTH AND STERLING AREA, 75th edition published by B.o.T. H.M.S.O. 17s. 6d. (see page 893).

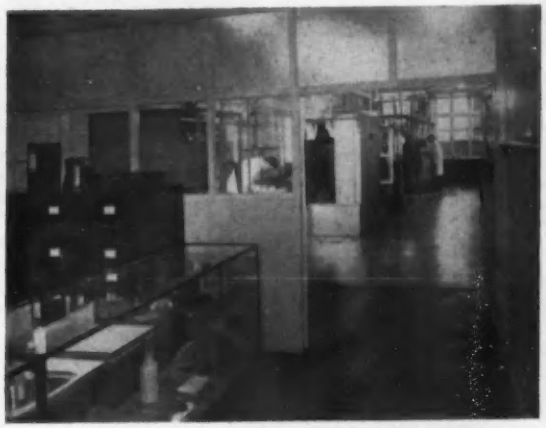
S. OF SCOTLAND ELECTRICITY. Provisional Order consolidating Local Enactments. Available from Parliamentary Agents, Beveridge and Co., 33 St. James's St, London, S.W.1 (see page 896).

SCIENTIFIC POLICY. Report on Recruitment of Scientists and Engineers by the Engineering Industry (see this page). H.M.S.O. 1s. 3d.

Metrovick's New Infra-Red Demonstration Section

REORGANISATION of their infra-red demonstration section in its new home at 132-5 Long Acre, London, W.C.2, has now been completed by the Metropolitan-Vickers Electrical Co., Ltd. Emphasis is being placed on the tubular-sheathed, element-type of plant, which is more robust and allows for higher loadings per sq in., although the room still includes a lamp plant. All the plants are operative and have a total connected load of about 90 kW. Equipment includes a variable speed mono-rail conveyor, a 6 ft spray booth, test panels and associated instruments. Heating engineers are always in attendance, and deal daily with industrial applications where heat processing is required for paint stoving, moisture extraction, preheating and curing.

View of Metrovick's new infra-red demonstration section which is situated at 132-5 Long Acre, London, W.C.2, and constantly available for those wishing to test the suitability of infra-red heating



SEPT. RADIO SALES

SOME recovery in the sales of radio and television sets are recorded by the latest figures issued by the R.T.R.A. in respect of Sept. Radio sales recovered after a bad August, but are still below those in the corresponding months in 1954. Sales of TV sets made a more marked improvement rising by 5·49 to an average of 11·9 a shop, but again, this falls short of last year's totals. The average number of sets sold per shop was as follows:

	1955	1954
RADIO		
August	8·72	12·29
September	9·84	12·13
TELEVISION		
August	6·41	10·76
September	11·90	12·94

The proportion of radio sets sold on hire purchase terms rose again slightly after the Aug. set-back, but as regards TV sales the proportion remained about the same. Both continued to be well below 1954 percentages.

Decline in Sales of Domestic Appliances

IN SPITE of the increased expenditure on advertising, reported on an earlier page, tighter hire purchase restrictions are reported to have reduced sales of electrical domestic appliances, according to one of the *Financial Times* recent periodic surveys. Progressive reduction in orders is stated to be having its effect on production, which is expected to fall further in the next few months. Falls of 20 to 25% in sales of electric cookers and washing machines are said to be commonplace, but refrigerator sales have been maintained, probably due to the warm summer. The fall in sales of vacuum cleaners was rather less than 20%. One appliance which is selling particularly well, is the electric space heater. Sales of fires are running about 25% higher than in 1954, and this is particularly so in the smokeless zones. In the country as a whole, however, this stimulus in the sales of fires, may well result from the difficulties many householders experienced in obtaining adequate solid fuel last year, and from the publicity given last summer to reports of a serious shortage this winter.

If sales of electrical appliances have fallen, there is consolation in the fact that the gas industry has suffered as badly, and probably worse. Gas appliance sales have been consistently running at about 20% below 1954 throughout this year. Cookers, washers and water heaters have been affected most, refrigerator sales have held their own, and records are being broken in increased sales of fires.

As a result of this survey, it is concluded that gas appliances were most seriously affected by the reintroduction of hire-purchase restrictions last March, and that the subsequent tightening of controls in July and the raising of purchase tax in Oct. was likely to prove of subsidiary importance. In the case of electrical appliances the March measures brought the earlier boom to an end, while the Chancellor's action in July seemed to have resulted in a reduction in sales of between 10 and 15%. The effect of the Budget, however, is at present not thought likely to be as serious as a further tightening in H.P. controls might have been. It is generally agreed that it is too early yet to assess the effects of increases in purchase tax rates.

Canadian Standards Approval System re-explained

ONE of the most valuable aids to electrical exports to Canada is the approval-in-advance service provided in this country by the B.S.I. At present almost all the £9m worth of electrical goods sent to Canada annually has Canadian approval before leaving the U.K. The service is being used by about 400 British firms. To strengthen the system further the Institution published last weekend a new and enlarged edition of the booklet on The Canadian Standards Association—Information for U.K. Manufacturers exporting Electrically Operated Equipment to Canada. The booklet first appeared in 1952.

A number of alterations and additions have been incorporated. A paragraph has been included concerning the approval of equipment incorporating pressure vessels. Another new section describes the availability of a consultative service in Canada concerned with exports of special kinds of wire and cable not subject to approval in the usual way. The appendix on Canadian Approval Specifications has been brought up to date, as has the appendix on Provincial Chief Electrical Inspectors. Further details are given on approval of flameproof equipment and acceptance of high rupturing fuses. Material is included on stator rotor units, and information on the service applicable to wires and cables has been amplified and revised.

VITREOUS ENAMELLING

LATEST exhibition to be opened at the Midlands Electricity Board's industrial showroom at 247 Chester Sq, Aston, is on Vitreous Enamelling. The exhibition is being staged in conjunction with Meta-electric Furnaces Ltd., Metal Porcelains Ltd., and other members of the Incandescent Group. It opened on Monday and will not close until 16 Dec. Qualified staff are in attendance.

NEW MOTOR WORKS IN AMUSEMENT PARK

AS Mr F. V. Brook, chairman, announced in the company's annual report, Brook Motors Ltd. have acquired a 28-acre site between the existing works at Huddersfield and Barnsley. The site was formerly an amusement park at Hope Bank, Honley, and is about four miles from the Huddersfield factory. The factory buildings will occupy about four acres initially and will be devoted to the manufacture of f.h.p. motors. A new design is being developed intended for the domestic appliance field, for use on washing machines, refrigerators, ironers, drying machines and similar items. Output is expected to be about 500,000 motors p.a. The new factory will be very similar to the Barnsley works opened in May last year. Brook Motors have been trying for some time to secure a suitable building site in the Huddersfield area, but were compelled to go further afield.

South of Scotland Board Seeks Law Consolidation

MORE than 200 local enactments concerned with the generation and supply of electricity will be consolidated in one order if proposals made by the South of Scotland Electricity Board are approved. The Board have presented a petition to the Secretary of State for Scotland asking for an order to this effect. They seek to repeal local enactments while retaining those provisions which are still "live." No new provisions are introduced, except for one minor clause dealing with the Board's internal administration, but in appropriate cases purely local orders will be extended to the whole of the Board's area.

This is believed to be the first time that a nationalised industry has consolidated all the local enactments which it inherited, and the first time in Scotland at any rate, that wholesale legislative execution has been practised to the extent of repealing 200 acts, etc. The Board considers the Order to follow logically on the amalgamation last April of the generating and distribution authorities in the area.

The subjects dealt with by the proposed Order range over the many details familiar in pre-nationalisation local acts and provisional Orders. The most generally interesting section is that relating to supplies to consumers. Amongst the matters dealt with there, are the right to charge for temporary supplies; restrictions on the right to use for any purpose electricity supplied for another purpose; and the power to enter premises. This last power extends the right of entry, subject to the restrictions of the Rights of Entry Act, to cases where any electrical fittings are installed, whether these are the property of the board or not, and where it is necessary to ensure whether any regulation or by-law dealing with the use of electricity is being contravened. Also, in another section, the use of other than coins of the realm in slot meters is made a specific offence, for which the penalty is a fine not exceeding £5.

The Draft Order is now under consideration by the Scottish Office. Before it comes into force it has to be confirmed by Act of Parliament.

EXHIBITION H.Q.

WE have been informed that the new address of the Electrical Engineers (A.S.E.E.) Exhibition Ltd. will be 6 Museum Hse, 25 Museum St, London, W.C.1. The telephone No. remains unchanged, Museum 3450.

The First Half-Century

Last July there was issued by the Board of Trade a summary of the regulations for overhead lines prescribed under No. A 13 of the regulations for securing the safety of the public, made by the Board under the Electric Lighting Acts of 1882 and 1888. The regulations were not intended to apply to the extra high-tension services of which so much is now being heard. Being anxious to ascertain the rules for extra high-tension, I made enquiries and found that at present there are none. Applications for consent to be made and each case is considered on its merits. The only positive rule, so far, is that proposals for extra high pressure wires carried alongside roads cannot be entertained: the transmission lines must go across open country. But though there are no fixed rules there are several in the making. These are concerned mainly with heights of poles, and their inaccessibility to the casual climber. On open moors 20 ft is likely to be the permitted height, as being really quite as safe as the 22 ft of the present regulations and making more for the stability of the line.—*From our issue of 7 Dec., 1905.*

Birds and Beef in London

THE advantages of electricity are demonstrated efficiently by the E.D.A. at two national exhibitions being held in London this week. At Earls Court between the 5 and 9 Dec. the use of electricity for crop conservation and the economic production of high protein winter food is the main theme at the Smithfield Show. The Association are aiming to show farmers how best to cut production costs by installing electricity.

Coincidentally, at Olympia, between 7 and 9 Dec., the Association are puttting on two displays at the Poultry Show. Special contribution to the Show's Chicken in the Kitchen section will be infra-red grill made by M.E.A.C. Ltd., in an all-electric kitchen. B.B.C. television cookery expert, Miss Marguerite Patten, is giving a series of demonstrations. Exhibits on the technical stand include electrical operated equipment for the rearing of chicks, incubation, production and cleaning of eggs, and poultry plucking.

Preston Depot

A NEW store and depot was opened by the General Electric Co. at Magnet Hse, Derby St, Preston, on Monday. It is being managed by Mr R. G. Galloway, and will do much to provide a better delivery service in North Lancs than has been possible hitherto. The trade will benefit also from increased stocking and counter facilities. Tel. No. is Preston 57871.

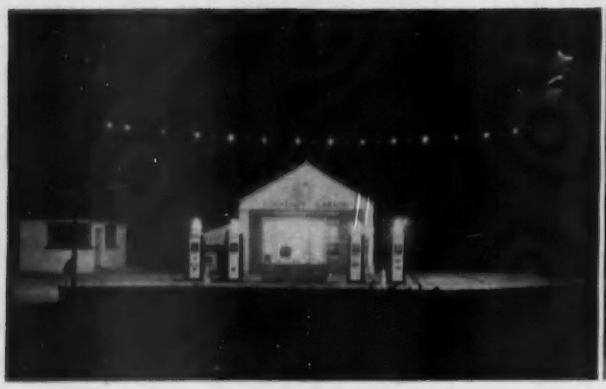
Lighting Styles for Petrol Filling Stations

WITH more motor cars on the roads the number of service stations is increasing and the competition in the "garage trade" is becoming greater. An excellent way of attracting passing motorists after dark is to have a good system of lighting, particularly in the forecourt. Many lighting firms have recognised this asset and are gaining plenty of business. One of those firms is Crompton Parkinson Ltd., whose latest work in Norwich and Nottingham is illustrated below.

Our photograph of the Boundary Garage, Norwich, shows how floodlighting with enclosed angle fittings and mercury vapour lamps can be used for the essential illumination of pumps and building frontage. Added effect has been achieved by a festoon of Colourglaze lamps.

An installation of a different style was planned for Nottingham's Castle Rock service station. In this case shorter columns were employed, and on them were mounted more contemporary fittings housing sodium lamps.

It will quickly be realised that no hard and fast rules can be laid down for such installations, as location, layout and design have to be considered. Of importance, too, are the safety precautions which have to be borne in mind, and the neighbouring street lights.



Flood and festooned lights give an air of gaiety to the Boundary Garage at Norwich, whilst efficiency and modernity is suggested by contemporary fittings at the Castle Rock service station in Nottingham

TECHNICAL TASKS FACING THE N.C.B.

A SCIENTIST'S view of the difficulties facing the National Coal Board was given in a lecture to the Royal Inst. of Public Administration last week by Mr A. H. A. Wynn, Scientific Member, National Coal Board. He stressed that because of the gradual exhaustion of the reserves of mineral in each individual mine, the productive capacity of the coal industry declines by 2 or 3% each year, unless there is large scale reconstruction or new collieries are opened. During the 34 years from 1913-1947 capital investment was too low to maintain capacity.

Mechanisation was soon recognised by the N.C.B. as an important factor in increasing coal output, but before 1947 the manufacturers' incentives to undertake active development in this field was not strong. During the last 8 years the machine development work has been markedly stepped up and there is now a much larger range of machines available than in 1947. An accelerated rate of mechanisation is now possible and the N.C.B. has recently taken decisions that include strengthening their Mechanised Branch in every area by teams of men specialising in the introduction of new machines. At present, however, only about 10% of deep mined coal is loaded by machine, the remainder being hand loaded. The N.C.B. is expending less than 1/10th of 1% of its turnover on mining research. It is recognised as a particularly low figure compared with other major industries. The board's plans for expenditure are limited primarily by the rate at which men of sufficient ability can be recruited.

One end of the new Atlas Showroom opened in Manchester

Another Lighting Showroom in Manchester

MANCHESTER now has another lighting showroom. Following the opening early in Oct. of E.L.M.A.'s new Lighting Service Bureau, Thorn Electrical Industries Ltd., have opened premises at 9 Stevenson Sq, for the display of their range of Atlas lighting products, and for demonstrations of lighting techniques and systems.

One of the main features of the Atlas showrooms is a fluorescent colour comparison section. The comparison spaces may be illuminated with any or all of the different fluorescent tubes, and are big enough to accommodate complete settings, even of furniture. The company's latest development in dimming, "Colorblend," is also installed in one of the spaces. Electronically controlled fluorescent lighting silhouettes a floating ceiling in a recessed area flooded with constantly changing colour. Other special displays demonstrate tungsten filament lamps and fluorescent control gear. A section has also been devoted to the Tricity Coronet cooker.

Research at Imperial College During 1952-55

RESEARCH investigations at City and Guilds College, the engineering section of Imperial College of Science and Technology, is summarised in a recently issued report covering 1952-55. The timing of the report is particularly appropriate since at the present session for the first time, the total number of engineering students at the College has exceeded 1,000.

In the electrical machines section of the electrical engineering department, attention has been given to the development of general methods for dealing with rotating machine problems. Theoretical studies have been made of the transient behaviour of a three-phase alternator under unbalanced load conditions. In this connection, the validity of well-known approximate methods neglecting harmonics has been examined. Another investigation has been concerned with the occurrence of oscillations in alternators. An improved transformer analogue analyser developed in the department has been used to predict the performance of rotating machines such as the capacitor motor and the Schrage motor. Use of the analyser has made possible trial and error methods which would not have been practicable with manual computing methods. Other investigations have been concerned with the effort of eddy currents on unlaminated magnetic material in machines, the effect of cross-magnetisation on the characteristics of a cross-field generator and with the effect of saturation and armature reaction on the build-up of a d.c. exciter supplying the field winding of an alternator.

Use has been made of analogue computers in studies of power systems, and in connection with this work an inexpensive semi-automatic digital computer has been developed for calculations with scalar or complex numbers. Various projects are also being built up in the control system field, based on the conviction that control systems should be designed in terms of the signals they will be required to handle, and that for the purpose of the design the signals can best be characterised statistically.

The report also gives details of the important work under way in the electronics and telecommunications section of the electrical engineering department, and of course, in the other engineering departments of the College. Included in the work of the Civil Engineering department is a new method of stress analysis for arch dams.

LESSA'S Christmas Concert

FEW seats remained untenanted at the St. Pancras Town Hall last week when the London Electricity Sports and Social Association's Music Society presented a choral and orchestral concert. The programme consisted mainly of light music and included such works as "From the Bavarian Highlands," "Orpheus in the Underworld," and "Rhapsody in Blue." Mr L. Atkins conducted the orchestra and Mr D. Sharpe the chorus. Solo baritone, Mr N. Fearing, sang three carols with support from the chorus.

NEWS IN BRIEF

Formation of the Federation of Engineering Design Consultants is announced. Headquarters will be at St. Stephen's Hse, Westminster, S.W.1. Membership will be drawn from firms of design consultants and contract drawing offices serving the engineering industry.

The Aluminium in Building Exhibition, currently showing at the Building Centre in Store St, W.C.1, is being extended. It will remain open until 31 Dec.

Eighth annual dinner of the foremen's section of the staff association of the Telegraph Construction and Maintenance Co., Ltd., and Submarine Cables Ltd. took place recently.

H.M. the Queen, patron of the Royal Commercial Travellers' Schools, has graciously given permission to the Hon. Claude Hope-Morley for a portrait to be painted by Mr Edward Halliday so that he can present it to the schools.

The Ekco "Radiotime" will be shown on commercial TV at 4 p.m. next Saturday. It is included in the programme "Home with Joy Shelton," and emphasis is on Christmas gifts for the family.

QUESTIONS IN PARLIAMENT

Promotional Advertising

ANSWERING Mr G. Nabarro, Mr L. W. Joynson-Hicks said that in addition to a reduction of £500,000 in advertising expenditure, both the electricity and gas supply industries have made proposals to defer other expenditure not immediately necessary. The Minister of Fuel and Power was considering these proposals. In reply to a supplementary question, he said it would be undesirable to give a direction to the electricity authorities to cease all promotional advertising.

Buy American Act

EXPLAINING his refusal to make representation to the U.S. Government against their ruling that 12% should be added to foreign bids for Government contracts in deciding awards of such contracts, Mr P. Thorneycroft said that the new arrangement was an improvement on past procedure.

Nuclear Reactors

AN explanation of the various nuclear reactors mentioned in and excluded from the White Paper was given by Mr L. W. Joynson-Hicks. The six additional reactors announced in June caused Mr W. Warbey to raise the matter. He was told that there had been no revision of the ten-year nuclear power programme. Mr Joynson-Hicks explained that the six reactors were exact replicas of that at Calder Hall and subsequently production could start at once, but the plants referred to in the White Paper were primarily for generating electricity, involving questions of design, siting and the like.

H.E. Board Construction

IN answer to a question by Mr G. Nabarro on costs of N. of Scotland Hydro-Electric Board schemes, the Secretary of State for Scotland gave the information shown in Table 1.

Select Committee

LAST week the Prime Minister, answering questions about the special report of the Select Committee on Nationalised Industries (see ELECTRICAL TIMES last week) said that the circumstances arising from the report were under consideration, and he hoped to be making a announcement on the subject very soon.

Technological Students

QUESTIONED about awards for students taking the proposed new diploma in technology, Mr D. F. Vosper, said students at technical colleges taking courses approved for the new award, would be eligible for the usual assistance from education authorities, including technical, but not ordinary State scholarships. The Minister of Education is considering whether the number of State scholarships should be increased.

Automation

THE Parliamentary Secretary to the Ministry of Works, said in a written reply, that the interim report on Automation in Industry prepared by D.S.I.R. would be in the hands of the printers early in the New Year.

Nuclear Power Staff

LAST week, Mr A. M. F. Palmer asked what steps were being taken to recruit and train engineering and scientific staff necessary for the country's programme of nuclear power generation. In reply, Mr L. W. Joynson-Hicks said that in the summer of 1954 the B.E.A. (as it was then) was asked for reports on the training of men for this work, and its plans were included in a training programme which the Minister of Fuel and Power approved this year. The Minister was now awaiting the assessment by the Authority of its requirements of skilled men of all types over the next 5 years. Mr Joynson-Hicks would not comment on Mr Palmer's suggestion that the Government, quite apart from the C.E.A., had a responsibility in the matter to ensure that the programme grew in reality as well as on paper.

TABLE 1: SCHEMES UNDER CONSTRUCTION.

Scheme	Date of commencement	Est. date of completion	Est. cost at time of confirmation*	Est. cost Nov. 1955
			£'000	£'000
Tummel-Garry and Gairloch ...	1945	1956	6,450	19,286
Tummel-Garry Amendments ...	1955	1957	102	102
Mullardoch-Fasnakyle-Affric ...	1947	1955	4,800	10,250
Shira	1948	1957	3,150	8,250
Storr Lochs	1949	1956	250	720
Glascarnoch-Luichart-Torr Achilty	1950	1957	8,700	19,400
Lawers	1951	1956	2,850	5,793
Moriston	1952	1958	13,000	14,000
Moriston Amendments				
Garry	1951	1956	4,850	9,556
Breadalbane	1953	1960	21,500	21,500
Breadalbane Amendments ...				
Allt-na-Lairige	1953	1956	620	1,450
Orrin	1955	1959	4,550	4,750
Loch Shin	1954	1959	8,800	9,000
Kilmelfort	1953	1956	458	730
Lussa Extension	1953	1956	310	320
Cowal Extension	1953	1956	350	370

* In most cases the estimates were made from one to four years before the date of commencement.

Trade with Eastern Europe

IN a written reply last week, Minister of State, Board of Trade, gave the following figures for exports to various States in Eastern Europe:

U.K. EXPORTS

	Value (£)	
	Jan.-Oct. 1954	Jan.-Oct. 1955
BULGARIA		
Diesel generating sets, over 200 kW	44,700	357,600
HUNGARY		
Copper wire	—	609,225
Electric machinery, apparatus and appliances	89,048	99,820
POLAND		
Copper wire	84,987	322,073
Electric machinery, apparatus and appliances	551,223	194,636

Scottish Railway Electrification

A PROPOSAL to electrify certain suburban railways in and around Glasgow had been approved in principle by the British Transport Commission, Mr J. Boyd-Carpenter informed Mr T. Steele in a written answer. He added that this was subject to the conclusion of a satisfactory agreement with Glasgow Corpn. for the co-ordination of transport facilities in the area. Negotiations were proceeding.

Pensions

REPLYING to questions by Dame Irene Ward and Mr A. Palmer last week, Mr L. W. Joynson-Hicks said the Electricity and Gas Authorities were responsible for reviewing pension schemes and suggesting changes, but had to seek Ministerial approval for amendments. The Minister had received proposals from the C.E.A. for increasing pensions of their ex-company pensioners and he was prepared to approve some supplementation.

Fluorescent Lighting Tubes

ASKED to draw attention to the public of the danger of phosphorus poisoning from broken fluorescent lighting tubes, Maj Lloyd George, the Home Secretary, stated that the tubes do not contain elemental phosphorous, and that there is no reason to suggest any special precautions when transporting them.

Underground Gasification

COMPLAINTS of the emission of noxious fumes over a wide area during

current underground gasification experiments in Worcestershire, were made by Mr G. Nabarro. Mr L. W. Joynson-Hicks said the experiments could not be continued without risk of some air pollution but steps were being taken to keep it to a minimum. He apologised, but added that while production was in an experimental stage gas had to be burnt to waste. If the experiments were successful the waste gas would be utilised.

Recruiting Science Teachers

IT was hoped that some improvement in the recruitment of science teachers would result from the increased salary allowance now available for teachers of advanced work, Mr D. F. Vosper stated recently in reply to a question by Mr S. S. Awbery on the shortage of science teachers. Other incentives to recruitment were deferred National Service for certain graduates in science and mathematics who took up teaching, and the growing recognition of the importance of the work. Mr Vosper went on to say that the only long-term remedy lay in a large increase in the output of scientists generally, and it was the Government's policy to secure such an increase from schools, technical colleges and universities.

Output and Cost of Nuclear Power

IN a written answer, Mr L. W. Joynson-Hicks said he was unable to give revised estimates of electrical output and cost per unit as regards nuclear power stations to be built under the nuclear power programme.

Price of Power

AMENDMENTS to the 1947 Electricity Act so as to enable Area Boards to fix maximum prices for the resale of metered electricity, was suggested by Mr S. Storey. Mr L. W. Joynson-Hicks said the matter would certainly be considered for inclusion in amending legislation at some future date.

Sayings OF THE WEEK

"American and British scientists, engineers and technicians cross the Atlantic by the hundred. In so doing they carry out that cross-fertilisation which brings its fruits in our laboratories, factories and classrooms just as surely as it does in nature." . . . LORD ADRIAN, President of the Royal Society.

"Ugly as pylons may be, they make life more beautiful for a lot of people." MRS J. KNIGHT, at Weston Favell Parish Hall.

"We ought to attribute our present satisfactory position in the field of nuclear energy, not to our ability to evolve technologies which are completely new or revolutionary, but rather to the ability which has been shown in adapting and developing existing techniques to problems which are completely new." . . . SIR CHRISTOPHER HINTON at the British Nuclear Energy Conference.

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ELECTRIC SUPPLY NEWS

Ashford

With the recent commissioning of three more sets the Ashford "B" power station of the C.E.A. is complete with five Mirrlees/Brush 2,000 kW diesel generators. The station was designed to meet the existing steam plant shortage and to reduce local peak loads. A full description of the station was given in our 17 Feb. issue.

Blyth

Objectors to the C.E.A.'s proposals to construct an aqueduct through which to sluice waste ash from the proposed power station at Cambois, have won the day. A House of Commons Select Committee last week approved the Blyth Generating Station (Ancillary Powers) Bill, after striking out the section which would have empowered the Authority to sluice the fly-ash into the sea. The ash will be dumped into the sea by barges, which means an increase in the cost of disposal. The committee approved the amended Bill which includes proposals to construct a single-line railway, and an aqueduct to discharge cooling water. During last week's hearing the Northumberland County Council sought an undertaking from the C.E.A. that the Council would be consulted regarding disposal of all material. For the C.E.A., Mr G. Thesiger, Q.C., gave an undertaking satisfactory to the petitioners.

Devon

Dissatisfied with the reasons given by the South Western Electricity Board for deferring a scheme to supply the village of Talaton with electricity the villagers are taking the matter further. It seems that the Board were proposing earlier this year to spend £33,000 on the scheme and had indeed made a start on the work, but with the recent financial restrictions the work has been suspended. At a meeting of the local inhabitants recently it was decided to ask the Prime Minister to intervene in the matter. The support of the Minister of Agriculture, the Minister of Fuel and Power, the local M.P. and other organisations is sought.

Kincardine

Contracts valued at about £2 millions have been placed by the South of Scotland Electricity Board in connection with their new generating station on the River Forth at Kincardine, where the first set is scheduled for commissioning in 1958. Bruce Peebles and Co., Ltd., are to supply one 144 MVA generator transformer; Mather and Platt Ltd. two booster and two boiler feed pumps; Sir William Arrol and Co. the turbine house crane, while Holloway Brothers (London) Ltd. will do the main civil engineering works, with structural steel work by Redpath Brown and Co., Ltd.

Ripon

A recommendation by the Public Health and Planning Committee refusing an application by the North Eastern Electricity Board for permission to erect overhead lines to The Knott, has been referred back by the Ripon-Pateley Bridge Rural Council. The scheme is held up, apparently, because the area planning officer considers that it is an area of high amenity value. But at the Rural Council meeting it was said that overhead lines were used as a means of supply all over the district. If the Board was asked to lay underground cables it might mean that the area would not get a power supply. It is hoped that by re-siting some posts, the difficulty may be overcome.

Selby

The Yorkshire Electricity Board are seeking permission to erect an overhead line across the River Ouse at a point on the downstream side of Selby. The Board has also agreed to discuss with the river engineers a suggestion that as an alternative a cable might be laid on the river bed. But the York Corporation Ouse and Foss Navigations Committee has recommended that no objection be raised to the proposal provided that if an o.h. line is decided upon, it will have a clearance of at least 100 ft between the top of the flood banks and the lowest point of the conductor.

Sutherland

The final break-through was made last week—three months ahead of schedule—in the five mile tunnel in connection with the North of Scotland Hydro-Electric Board's Loch Shin project, near Lairg, Sutherland. The first break-through in the 10,000-ft section of the 16-ft diameter tunnel was made at the beginning of last month.

LIGHTING SCHEMES

Belfast. The town clerk, the city treasurer and the police executive officer have been instructed to submit a report on street lighting to the Corporation Police Committee.

Exeter. It is proposed to prepare a lighting scheme for Victoria Park Road, Haven Road and Queen's Road.

Exmouth. The U.D.C. has approved a £12,800 scheme for new lighting along A.377 road through the town.

Ilkeston. The council is considering modern street lighting from Hallam Fields to Cotmanhay. Fluorescent lighting is suggested costing around £13,000.

Machynlleth. With a scheme for lighting of main streets in abeyance owing to lack of funds, the surveyor has been asked to prepare a scheme for the side streets.

COMPANY ACTIVITIES

GREAT credit is due to the new board of the Peto Scott group headed by Mr C. F. Hollamby. In less than a year they have turned a net loss of £31,000 into a net profit of £61,000. And after resuming dividends with a payment of 16⅔% after a lapse of two years, they are able to carry forward a credit of £56,239. The adverse balance at June 30, 1954 of £62,042 was written off by cancelling 1s. 4d. on each of 900,000 shares of 2s. Resulting shares of 8d. were sub-divided and consolidated into shares of 1s. Last July 600,000 1s. shares were offered at par on a one-for-one basis. These new shares do not participate in the dividend now announced.

After a three-hour meeting the opposition to the Sterling Industries board, undertaken by Mr L. G. Harris, was defeated. The retiring directors Mr G. S. Green, Mr R. A. Harding (chairman), Mr P. W. M. Dean, and Mr L. W. Hammerson (co-opted after discussion with Mr Harris) were re-elected. A surprise was a demand for a poll by Mr L. G. Harris on the resolution to re-elect Mr Green. This resulted in 1,226,006 votes in favour of Mr Green and 995,008 against. The other retiring members were thereupon re-elected by a show of hands.

The chairman then pointed out that nominations to elect Messrs Ricards, Petzal and Glasgow fell through as the present board has been re-elected. He pointed out that at the annual meeting in 1951 the resolution had been passed limiting the maximum number of directors to five, so that the election of any additional directors was business which the meeting was not competent to consider.

A surprisingly resilient comparatively minor group in the electrical manufacturing industry is British Electric Resistance. It has a distinguished record of earnings and dividend payments. Despite growing competition in overseas markets and growth of import restrictions, trading profit was just slightly higher at £66,800 and the dividend maintained at 20%. Cover for that payment is about 3½ times so that the 2s. shares at 4s. 6d. provide nearly 9% yield. There has been some deterioration in the liquid position partly because of a £29,000 jump in the stock figure to £122,000 and also to the introduction of new lines which has meant a larger investment in manufacturing equipment. The chairman takes a hopeful view of immediate prospects, subject, of course, to the now general reference to labour difficulties and rising costs.—*From our City Correspondent.*

Aberdare Cables Africa Ltd.

The consolidated net profit for the year to 30 June last is £52,042 (*£66,206*), and the dividend is again 15%.

Brook Motors Ltd.

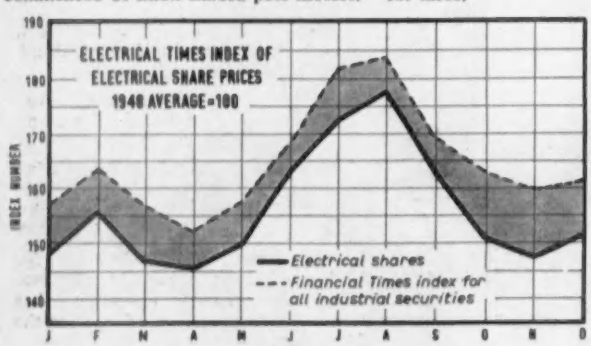
A record turnover was achieved for the past year, resulting from the continued upward demand both at home and overseas. The range of industrial motors has been further developed with notable success, and production has commenced of small shaded pole motors. Further premises have been acquired, part of which will be used for the repair of equipment of any make—a prosperous side of the business, Mr F. V. Brook, the chairman, states. A freehold 28-acre site near Huddersfield is being acquired where it is intended to build a factory for f.h.p. motor development. The American sales concern, Brook Motor Corporation, has shared in the trade boom now taking place there, and the office premises have been doubled and the staff increased to cope with the additional business.

Year to 30 Sept.	£ Trading Profit	£ Net Profit	% on Ord. Earned	% on Ord. Paid	Ord. Price High	Ord. Price Low
1951	560,769	219,870	95	20	38/6	32/6
1952	762,970	242,206	105	20	34/3	28/–
1953	516,107	104,950	36	20*	37/3	27/10
1954	599,040	227,006	71	20†	47/–	29/1
1955	675,079	261,910	66	25	46/6	39/–

*Plus 16⅔% capital bonus. †Plus 14⅔% capital bonus.

Crofts Engineers (Holdings) Ltd.

Consent of the C.I.C. has been received to the capitalisation of £500,000 of reserves by the issue of 2 million 5s. Ordinary shares in the proportion of one-for-three.



Share prices started to rise again in November for the first time since July. Both indices show this new trend. The "Financial Times" index for all industrial shares rose by 1·5 to 161·8, and the "Electrical Times" index for all electrical shares by 2·6 to 150·8

Metal Agencies Ltd.

Ordinary stockholders are offered 939,790 5s. Ordinary shares at 5s. 6d. each in the proportion of one for every two 5s. units held.

Peto Scott Electrical Instruments Ltd.

Before charging depreciation and management expenses, etc., the profit for the year ended 30 June last is £77,510 (*£16,381*). After taxation, etc., the net profit amounts to £61,176, compared with a previous loss of £30,882. Dividends are to be resumed with 16⅔%.

Plessey Co., Ltd.

Both the volume of business completed and the profit earned was a record, but Mr A. G. Clark, the chairman, adds that the profit was still only a very small percentage on the turnover, and is less than the extent to which manufacturing costs have risen in the last 2½ years. The large amount of research and development work in recent years is now bringing its reward with the result that the range of activities continues to widen, and expansion is proceeding even more rapidly than had been anticipated. In consequence the additional capital raised less than 2 years ago has already become fully employed, and the question of further finance is under discussion.

Year to 30 June	£ Trading Profit	£ Net Profit	% on Ord. Earned	% on Ord. Paid	Ord. Price High	Ord. Price Low
1951	812,463	214,146	144	22½	22/3	17/–
1952	1,055,096	232,575	158	25	21/–	16/3
1953	1,151,206	304,009	202	30	38/3	20/1
1954	1,382,748	473,484	125	20*	65/4	37/10
1955	1,890,568	809,023	170	27½	88/6	55/–

* Plus 100% capital bonus.

George H. Scholes and Co. Ltd.

A placing is being arranged by Charterhouse Finance Corporation of about 25% of the Ordinary capital of this concern, well known for its "Wylex" electrical equipment. Application is also being made to the Manchester Stock Exchange for a quotation of the Ordinary capital of 850,000 5s. shares. It is stated that profit for the year to 30 June last, before taxation, amounts to £184,239. Current sales and orders on hand are higher than at this time a year ago and the directors expect that the profits can be maintained at a level which will justify not less than 22½%.

Dividends Declared

Ada (Halifax) Ltd. Interim 10% (*same*).

Bellis and Morcom Ltd. Interim 4% (2½%). The directors state that there is unlikely to be an increase in the total paid for the year (*11%*).

Bellis and Morcom Ltd. Interim 4% (*same*).

London Electrical and General Trust. Interim 4% (*same*) on doubled capital.

Revo Electric Co., Ltd. Interim 3½% (*same*). The directors state that estimated profits for the six months to 30 Sept. last show a small reduction, but the second half is the period of greatest activity and in present circumstances the outlook is considered to be not unsatisfactory.

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders unless otherwise stated.

9 Dec.—Colne T.C. Conversion of street lighting from gas to 60 W sodium discharge lighting.—See 24 Nov. issue.

9 Dec.—Sheffield T.C. Installations in 108 dwellings Greenhill Bradway estate and 56 on Gleadless Valley estate.—See 1 Dec. issue.

9 Dec.—Skipton R.D.C. Sodium vapour street lighting units on concrete columns along trunk road A.629.—Advertised in 24 Nov. issue.

10 Dec.—Ashton-in-Makerfield U.D.C. Concrete columns, lanterns, switches, mercury vapour discharge lamps, for class B street lighting in Downall Green Rd.—See 24 Nov. issue.

10 Dec.—Staffordshire. Washing machines and hydro extractors for Education Dept.—See 24 Nov. issue.

12 Dec.—Easthampstead R.D.C. Group A and B street lighting units.—Advertised in 13 Oct. issue.

12 Dec.—Ellesmere Port T.C. Group B street lighting units as "in filling" in various parts.—See 24 Nov. issue.

12 Dec.—Lanarkshire. Lanterns for sodium lamps, with leak transformers and capacitors for trunk road A.74.—See 24 Nov. issue.

12 Dec.—Richmond (Yorks) T.C. Sodium discharge street lighting units on concrete columns.—See 1 Dec. issue.

14 Dec.—Dublin. Installation at Stewart's Hospital, Palmerstown.—See 24 Nov. issue.

14 Dec.—Marple U.D.C. Erection and wiring of Group B street lighting installation comprising 170 80 W mercury vapour units. Surveyor, Council Offices.

14 Dec.—Newcastle-on-Tyne T.C. Electrical and heating installations in 298 houses on Kenton North estate.—See 24 Nov. issue.

15 Dec.—Belfast T.C. Renewal of lighting circuits in Park Parade school.—See 1 Dec. issue.

15 Dec.—Cirencester U.D.C. Supply and installation of 92 400 W mercury discharge lamps and 70 concrete columns, for Group A street lighting on 2 miles of trunk road. Surveyor and Water Engineer, Municipal Offices. Deposit £2. 2s.

15 Dec.—Leeds. Installation in nurses' home at St. James's Hospital.—See 17 Nov. issue.

15 Dec.—Rutherglen T.C. Electrical installation in five shops in Blairbeth housing scheme. J. C. Russell, Burgh Surveyor, Town Hall Bldgs.

16 Dec.—Ballymoney (N.I.). Installation at Ballymoney Girls' Primary school.—See 1 Dec. issue.

16 Dec.—Christchurch T.C. Installation in 30 dwellings on Somerford estate.—See 1 Dec. issue.

16 Dec.—Macclesfield T.C. Class B sodium lighting units on concrete columns in Hurdsfield housing scheme and Palmerston Rd estate.—Advertised in 1 Dec. issue.

16 Dec.—Swinton and Pendlebury T.C. Electrical installation in 80 houses in Clifton Development. Borough Engineer and Surveyor, Town Hall.

16 Dec.—Wandsworth B.C. Lamps in two years from 1 Apr.—See 24 Nov. issue.

16 Dec.—West Ham B.C. Twelve electric vehicles for street cleansing.—Advertised in 1 Dec. issue.

17 Dec.—Dublin T.C. L.T. switchboard for Stanley St Depot.—See 1 Dec. issue.

17 Dec.—E. Anglia. Applications invited for inclusion in approved list of contractors in respect of various classes of work. Architect of E. Anglian Hospital Board, 33 Parkside, Cambridge.—Advertised in this issue.

17 Dec.—Preston T.C. Electrical equipment for Alston Hall College of Further Education.—See 1 Dec. issue.

17 Dec.—Selkirk T.C. Mercury discharge street lighting along trunk road A.7.—See 24 Nov. issue.

19 Dec.—Bedfordshire. Electrical installation in county primary junior and infants' school on Putnoe estate, Goldington. Names to County Architect, Shire Hall, Bedford, by above date.

19 Dec.—East Riding. Installation in Hornsea county secondary school.—See 24 Nov. issue.

19 Dec.—Musselburgh T.C. Steel columns with mercury discharge and sodium lamps.—See 24 Nov. issue.

19 Dec.—Tredegar U.D.C. Supply and erection of 48 steel columns with 140 W sodium discharge lamps and 27 brackets and lanterns for existing poles. Engineer and Surveyor, Park Chambers. Deposit £2. 2s.

19 Dec.—West Riding (Yorks) C.C. Electrical services at Shroggs Head Primary School. Apply by Dec. 12.—See 1 Dec. issue.

21 Dec.—Galashiels T.C. Group A mercury discharge lighting along trunk road A.72.—See 1 Dec. issue.

21 Dec.—Hawick T.C. Steel columns with mercury vapour lighting, equipment at Wilton Hill.—See 24 Nov. issue.

21 Dec.—N. Ireland. Electrical installation at Princess Gdns school, Colinmore. J. R. W. Murland, consulting engineer, 13 Wellington Place, Belfast. Deposit £3. 3s.

23 Dec.—Stranraer T.C. Supply and erection of 62 250 W mercury vapour street lighting lanterns with control gear wiring and concrete columns along trunk roads. Burgh Surveyor, Dunbae Hse.

28 Dec.—Bridgwater T.C. Supply of concrete columns with 140 W sodium lamps, control gear and cable, for Relief Rd. Borough Engineer, Town Hall. Deposit £2. 2s.

28 Dec.—Marshland R.D.C. Installation in 26 houses at Walpole St. Peter.—See 24 Nov. issue.

29 Dec.—Co. Down. Electrical installation at Dundonald intermediate school. A. W. Gordon Holt, consulting engineer, 74 South Parade, Belfast. Deposit £3. 3s.

29 Dec.—Kirkcaldy T.C. Electrical installation in five shops and five maisonnettes in Links St. James Gentles and Son, quantity surveyors, Osborne Hse.

30 Dec.—Hendon T.C. Supply and installation of lanterns for 140 W sodium lamps, transformers, condensers, etc., on concrete columns. Plan No. L.225. Apply by 17 Dec. to Borough Engineer and Surveyor, Town Hall, N.W.4. Deposit £2. 2s.—Advertised in this issue.

31 Dec.—Bristol. Electrical equipment for College of Technology.—See 1 Dec. issue.

31 Dec.—Cheshire. Supply of electric lamps. Applications for inclusion on official list to G. Evans, County Welfare Dept., 50 Hough Green, Chester.

31 Dec.—Middleton T.C. Installation in 68 houses and 36 flats.—See 1 Dec. issue.

31 Dec.—West Riding. Contractors invited to apply for names to be included on lists of selected contractors.—Advertised in 17 Nov. issue.

31 Dec.—Wrexham R.D.C. Installations in 110 houses at Cefn, Esclusham Below, Gwersyld, Penycae and Ruabon.—See 1 Dec. issue.

7 Jan.—Dagenham T.C. Supply of electric lamps, cables, conduit and accessories in year from 1 Apr. Borough Engineer and Surveyor, Civic Centre.

7 Jan.—Ruislip (Middlx.) U.D.C. Supply of lamps from 1 Apr.—See 1 Dec. issue.

11 Jan.—Dublin T.C. Sewage pumps and electric motors and storm water pump and electric motor for Kilbarrack pumping station.—See 27 Oct. issue.

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources including an index of trade information with over 100,000 entries

A Selection from the 102 queries answered this week

"Humex" greenhouse heaters, makers of? M.I.—Roberts Electrical Co., Ltd., 11/13 High St, Byfleet, Surrey.

Flameproof all-electric unit heaters, makers of? E.W.—Standard and Pochin Bros., Evington Valley Rd, Leicester.

"Cadillac Roto Grill" cookers, suppliers of? N.E.—Allen Walters and Co., Ltd., 6a St. John's Hill, S.W.1.

"Stitchmaster" sewing machines, agents for? L.B.—Fridor (Gt. Britain) Ltd., 66 Victoria St, S.W.1.

Espresso-type coffee makers, suppliers of? A.W.—Espresso Coffee Makers, 24 Eastcheap, E.C.3; Riservato Partners Ltd., 10 Dean St, W.1; Accessories and Electrical Supplies (Wholesale) Ltd., 127 High Rd, N.15; A. and M. G. Sassoon, 38 Lowndes Sq, S.W.1 (for use on hotplates).

Growler armature testers, makers of? D.E.—Martindale Electric Co., Ltd., Westmoreland Rd, N.W.9; Autocar Electrical Equipment Co., 32 Albert Embankment, S.E.11; Armature Mfg. Co., Rushbank Electrical Works, Burnley St, Oldham; W. H. Grimmer Ltd., 50 Bow Lane, E.C.4; Runbaken Electrical Products, 71 Oxford Rd, Manchester 1.

20 Jan.—Lincolnshire. Rewiring of electrical installation at St. George's Residential estate, Stamford. County Architect, County Offices, Sleaford.

26 Jan.—Belfast T.C. Supply and erection at Power Station West extension of 33 kV and lower voltage cables and accessories. Tender N.1806. Merz and McLellan, consulting engineers, Carliol Hse, Newcastle-on-Tyne. Deposit £5. 5s. Advertised in this issue.

27 Jan.—Belfast T.C. Supply, erection of five 33/6·6 kV 12,500 kVA outdoor stepdown transformers with on-load tap changing equipment. Tender N.1736a. Merz and McLellan, consulting engineers, Carliol Hse, Newcastle-on-Tyne. Deposit £5. 5s.—Advertised in this issue.

No date stated—Ayrshire. Tenders invited for any or all of following in lighting trunk road A.78: supply of concrete columns; electrical equipment; lanterns for 140 W sodium vapour discharge lamps; and installation work. Apply to County Engineer, County Bldgs, Ayr.

No date stated.—Romford T.C. Electric lamps included in list of annual requirements. Borough Engineer, Town Hall.

No date stated—N. of Scotland H.E. Board. Lighting and heating installation at Mybster substation, Caithness.—See 1 Dec. issue.

No date stated.—N. of Scotland H.E. Board. Lighting, heating and 11 kV main and auxiliary cabling installations at Allt-na-Lairige power station and Lairige dam. Merz and McLellan, 72a George St, Edinburgh.

No date stated—N. of Scotland H.E. Board. Supply and erection of 11 kV indoor switchgear and ancillary equipment for Shin power station, Sutherland. Kennedy and Donkin, 12 Caxton St, London, S.W.1. Deposit £2. 2s.—Advertised in this issue.

. . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon House, Theobalds Rd, W.C.1, quoting reference.*

28 Dec.—Greece. Supply of 12,000 metres of lead sheathed cables type N.G.K. 1,000 V, for Ministry of Finance State Procurement Service, 56 Panepistimion St, 3rd Floor, Athens. Contract No. 455. B.o.T. (Ref.: ESB 25588/55).*

29 Dec.—Rhodesia and Nyasaland. Supply, erection, two 4-motor overhead electric travelling cranes for Kariba power station. Details to both the secretary, Federal H.E. Board, P.O. Box 630, Salisbury, S. Rhodesia, and Merz and McLellan, Carliol Hse, Newcastle-on-Tyne.—Advertised in this issue.

4 Jan.—India. Manufacture, erection, etc., five 180,000 lb p.h. water tube boilers with ancillary plant for Korba power station. Madhya Pradesh Electricity Board, New Castle Building, Seminary Hills, Nagpur. B.o.T. (Ref.: ESB 25031/55).*

5 Jan.—South Africa. Tenders invited for supply of 27,720 yd of p.v.c. switchboard cable. Union Tender and Supplies Board, 291 Bosman St, Pretoria. B.o.T. (Ref.: ESB 25356/55).*

15 Jan.—Iraq. Supply of transformers, switchgear, outdoor circuit-breakers, copper conductors, underground cables, joint boxes, poles, h.t. and l.t. insulators, etc. Copy of documents available from Electricity and Water Board Mosul. B.o.T. (Ref.: ESB 25576/55).*

18 Jan.—Belgian Congo. Supply, installation, etc., of luminous landing beacons at Leopoldville aerodrome. Specif. 850. Documents from Service des Approvisionnements du Ministere des Colonies, 1 rue de la Regence, Brussels. B.o.T. (Ref.: ESB 25847/55).*

18 Jan.—Uruguay. Tenders (No. 2422) invited for 17,800 lengths of flexible cord for telephone apparatus. Usinas Electricas y los Telefonos del Estado, Montevideo. B.o.T. (Ref.: ESB 25776/55).*

31 Jan.—India. Supply of 33 kV solid type supertension cables and accessories for Howrah Grid substation. Tender E.D. 719-2. Dep. Chief Electrical Engineer (E. and R.), Damodar Valley Corpn., Anderson Hse, Alipore, Calcutta. B.o.T. (Ref.: ESB 25845/55).*

New Zealand. State Hydro-Electric Dept., Wellington, invite various tenders: **21 Feb.:** One 30,000 kVA 66/11 kV TCOL transformer bank and spare for Bromley (Christchurch) substation; **20 Mar.:** 11 kV indoor switchgear for same; **28 Feb.:** 12 three-phase 66 kV 1500 MVA circuit-breakers for Horata substation; **7 Feb.:** One 100,000 kVA 220/110/11 kV transformer bank and spare for Otaharu substation: **24 Jan.:** One 15,000 kVA 11/11/50 kV TCOL transformer bank and spare with one 3-phase 11 kV earthing transformer for Atiamuri power station; **14 Feb.:** One 2,500 kVA 11 kV regulating transformer and earthing transformer for Kikiwa substation; **28 Feb.:** A 50-ton electric overhead travelling crane for Kikiwa substation; **6 Mar.:** One 10,000 kVA 11/33 kV transformer bank and spare for Mangahao power station; and **31 Jan.:** 150 MVA 11 kV switchgear for Kikiwa substation.

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, 6 December

	£ per ton	Weekly change £	Price last year £
COPPER, standard class A (settlement)	393	+5½	281
„ (3 months)	380	+3	265
R.S.T. (Rhodesian Selection Trust) group price*	360	—	—
LEAD, refined pig, min. 99·97% purity (cash)	111½	+1½	104
„ (3 months)	110½	−½	103½
TIN, refined, min. 99·75% purity (settlement)	812½	+34½	716
„ (3 months)	801	+33	714
ALUMINIUM, ingots 99·99·5%	171	—	156
ZINC, virgin, min. 98% purity (cash)	99	+2	82½
„ (3 months)	94½	+1½	82
RUBBER No. 1, RSS. spot (per lb.)	39d.	+1d.	24½d.
„ c.i.f. basis, ports. Jan. (per lb.)	37½d.	+1d.	24d.
ARMOURING:			
Galv. Steel Wire (0·104 in.)	56½	—	52½
Mild Steel Tape (0·04 in.)	43½	—	40½

(*Fixed price c.i.f. U.K., now subject to change at 24 hours' notice, to "consumers willing to instil a degree of stability into the resale price.")

Gazette Announcements

COMPANIES ACTS

Multi-Ray Heaters Ltd. Roy Lawrence, 4 Waterloo St, Birmingham 2, has been appointed liquidator.

Vicom and Co. (Sales) Ltd. Resolution voluntary winding-up passed at meeting on 28 Nov. when B. Phillips of 76 New Cavendish St, W.1, was appointed liquidator. Creditors are asked to send particulars to him by 30 Dec.

Electrical and Radio Installations (Ealing) Ltd. Last day for receiving proofs in respect of intended dividends, 16 Dec. Liquidator is J. B. Clifford of 4 Bucklersbury, London, E.C.4.

Partnership Dissolved

J. and H. Flack. Partnership between Harry Flack and John Flack, trading under above name as agricultural and electrical engineers at High St, Lakenheath, Suffolk, dissolved as from 31 Oct. Debts received and paid by J. Flack, who will continue business.

BANKRUPTCY ACTS

Public Examination

Swindon. Dennis L. Stoneham, electrical contractor trading at 3 Crombey St, Swindon. Public exam. will be at County Court Buildings, Clarence St, Swindon, on 11 Jan. at 11 a.m. First meeting took place yesterday (7 Dec.). Receiving order dated 23 Nov.

Appointment of Trustee

Liverpool. William J. K. Incledon, electrical engineer, trading at 203 West Derby Rd, Liverpool. Trustee is S. O. Henry, regd. acc., 5 Rumford Place, Chapel St, Liverpool.

Dividends

Torquay. George Frankis and Bernard W. V. Smith, trading as Brixham Electric Service, at 4 The Strand, and 9 Fox's Court, Brixham. First dividends of 1s. 6d. in £ payable at 12 Pennsylvania Rd, Exeter, today (8 Dec.).

Release of Trustee.

Birmingham. Arthur Fielder, trading as A. Fielder and Co., radio and electrical retailer, at 314 Shortheath Rd, and 4 Cooksey Lane, Erdington. Trustee was R. K. Clark, Official Receiver, Somerset Hse, 37 Temple St, Birmingham.

Intended Dividends.

Gloucester. Walter E. Sparrow and Florence Sparrow, electrical contractors trading as Sparrow and Co. at 8 Longsmith St, Gloucester. Last day for receiving proofs, 16 Dec. Trustee is G. W. Sisman, Official Receiver, 26 Baldwin St, Bristol.

Contracts Placed

Glasgow T.C. Installation at secondary school in Knightswood Rd, James Kilpatrick and Son Ltd., £16,605.

Newbury (Berks) T.C. Street lighting works in London Rd., Cohen Bros. (Electrical) Ltd., £5,631.

Whitley Bay T.C. Rewiring council houses, A. Hagerty, £1,157; supply of 45 sodium street lighting units in Hill Heads and Marden Rds, Revo Electric Co.

BUSINESS PROSPECTS

Home

Alloa. Dean of Guild Court has approved extension of turbine shop and other works at B.E.P. Works for Harland Engineering Co. Estimated cost £148,000.
Co. Antrim. Erection of primary school at Upper Ballyboley. K. A. MacCormac, Director of Education, 475 Antrim Rd, Belfast.
Bermondsey B.C. It is proposed to erect 57 flats in three blocks on Roseberry St site. Estimated cost, £132,172.
Bury. Scheme approved in principle for casualty dept. at General Hospital for Manchester Hospital Board. Cost estimated at £59,310.
Camberwell. Quantity surveyors for chest clinic at St. Giles' Hospital will probably be Cyril E. Kenney and Partners, 36 Gloucester Place, W.1.
Chesterfield R.D.C. It is proposed to rewire council houses at Holmewood at cost of about £1,685.
Croydon. Phoenix Assurance Co., Ltd., King William St, London, E.C.4, to erect offices at 11 Wellesley Rd. Contract to be placed in New Year.
Dartford T.C. Erection of 72 dwellings on Temple Hill neighbourhood unit. T. Armstrong, Town Clerk, Council Offices.
Dundee T.C. Approval in principle given to erection of multi-storey flats at Hilltown and Balgay Hill.
Exeter T.C. Application to be made to borrow £81,816 for erection of Beacon Heath infants' school.
Fife. Approval given to erection of 45 houses at East Wemyss.
Glasgow T.C. Scheme approved for alterations in East Building of Municipal Buildings, including electrical works which are estimated to cost £35,000; also cost of electrical work in reinstatement of Kingston Halls will be about £6,000.
Halesowen T.C. Construction of 102 houses on Furnace Park estate. A. T. Butler and Partners, Architects and Surveyors, 31 Priory St, Dudley.
Hamilton T.C. Erection of 80 flats in Edward and Burn Clea Sts Development. Burgh Architect, 106 Cadzow St.
Hillsborough (N.I.) R.D.C. Erection of 52 houses in Breda Rd, Newtownbreda. Architect, W. B. Maxwell, 5 University Terr, Belfast.
Hinckley U.D.C. Council offices costing £135,000 proposed.
Huddersfield. Work on new hospital at Green Lea for Leeds Hospital Board is scheduled to start on 1 Apr., 1957.
Ilford T.C. Approval sought for inclusion of schemes for lighting improvements at Highlands, Goodmayes and Loxford schools in 1956-57 programme.
Leigh (Lancs). Application to be made to borrow £173,776 for new divisional police headquarters.
Llangollen. Factory proposed by Caldecott Press Ltd. on site adjoining Berwyn works. Plans by Venables and Williams, West Rd, Congleton.
London. Extensions costing £100,000 being planned at Whitby Ave, N.W.1, for Mabie Todd and Co. Ltd.: Sir Alexander Gibb and Partners, Queen Anne's Lodge, S.W.1, are consulting engineers. Also, Brixton Development Co. Ltd. to build factory in Neasden Lane, N.W.10. Architects are L. Solomon, Son and Joseph, 21 Bloomsbury Way, W.C.1.
Loughborough. W. Cotton Ltd., Baxtergate, planning to build factory at corner of Bottleacre Lane and Belton Rd. Two-storey extensions at Lower Mills, Cotes, proposed by Goodacre and Everard.
Middlesex. Revised scheme in hand for final development of Trent Park Training College. Cost estimated at £195,875.
Nantwich U.D.C. Ministry approval sought for erection of 156 houses and flats.
Newcastle-on-Tyne. Start to be made next spring on erection of new £270,000 Rutherford High School. Final plans in hand for £145,000 scheme to build Firfield secondary modern school.
North Riding. Tenders to be invited for erection of Redcar West county modern school. Quantity surveyors are Davis, Belfield and Everest, 9 Ashley Place, London, S.W.1.
Oundle (Northants) U.D.C. It is proposed to erect 12 houses and two blocks of 4 flats on Rock Rd site. Council Offices, Thrapston, Northants.
Pembrokeshire. Erection of new secondary school at Crymmych. County Architect, Lt-Col. Walter Barrett, County Offices, Haverfordwest.
Penicuik (Midlothian). Dean of Guild Court has approved plans for cinema in John St for Caledonian Assoc. Cinemas Ltd., GlenMhor, Whiting Bay, Brodick, Isle of Arran.
Peterborough. Plans in hand for new hospital adjoining Memorial Hospital in Midland Rd. Estimated cost £1½m. E. Anglian Hospital Board expect work will begin in two years' time.
Portsmouth T.C. It is proposed to erect a further 210 houses in Westleigh area, Leigh Park.
Reading. Plans submitted for factory in Commercial Rd, for Radio Products, 15a Church Rd, Caversham.
Rugby T.C. Rewiring and other work to be carried out at Regent St swimming bath.
Ryde (I.O.W.) T.C. Revised layout plans approved for 121 houses and shops on Binstead estate.
St. Austell (Corn) U.D.C. It is proposed to erect 30 houses each at Gover Rd and Penwithick, 40 at Eastbourne and 20 at Mevagissey next year.
St. Marylebone. Congregation of St. Johns Wood Synagogue, Marlborough Place, N.W.8, propose to erect new synagogue, communal hall and classrooms in Grove End Rd at estimated cost of £250,000.
St. Pancras B.C. Approval sought for scheme for major repairs at Prince of Wales Rd Baths, which is estimated to cost £136,000.
Sheffield. Land in Greenland Rd may be leased to Keeton, Sons and Co. Ltd., of Royds Lane, who propose to erect engineering works.
Shipley. Works and offices in Otley Rd proposed by Herbert Walker and Son Ltd., Manor Lane.
Stockport T.C. Tenders may soon be invited for erection of 255 dwellings on Binnington neighbourhood unit. Quantity surveyors are Brown and Spencer, 26 Cross St, Manchester.
Stokesley (Yorks) R.D.C. New estate of 120 houses to be built at Nunthorpe Station.
Swansea T.C. Erection of new infants' school at Trallwn. Borough Architect, The Guildhall.
York T.C. Erection of 36 flats and maisonnettes in Chaloners Rd. E. Frith, City Architect, 8 St. Leonard's Place.

Overseas

Canada. Representation of U.K. manufacturers of electrical equipment (measuring apparatus, fuses, contact breakers, etc.) sought by Mr E. Cecil Parsons, Hilltop, P.O. Box 300, Whiterock, B.C. Mr Parsons will undertake representation for British Columbia and Alberta, or for whole of Canada.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, W.C.2.

C.T.C. Heat (London) Ltd., 17 Sloane St, S.W.1. Manufacturers of central heating and cooling plants, refrigerators, etc. Nom. cap.: £500. Dirs.: Sven-Ake Sihlen and B. G. Hansson.

Whitehouse Engineering Co., Ltd., 3 Allerton St, Cardiff. To acquire goodwill of business of James Whitehouse carried on as "Whitehouse Engineering Co." at Cardiff, electricians, engineers, etc. Nom. cap.: £1,000. Dirs.: J. Whitehouse and J. W. Fleming.

Electrical Appliances (Ruislip) Ltd., 265 Strand, W.C.2. Development and manufacture of scientific and medical appliances, etc. Nom. cap.: £1,000. Dirs.: C. T. Taylor, A. T. G. Fairbrass, and L. N. Parker.

Relay Adjusting Co., Ltd., 70 High Rd (Park Lane Corner) Broxbourne, Herts. Assemblers, testers and adjusters of electrical relays and circuits, etc. Nom. cap.: £500. Dirs.: A. T. Izzard, L. D. H. Izzard and B. G. Izzard.

Dampp-Chaser Ltd., Langston Rd, Debden, Loughton, Essex. Manufacturers of electrical damp eliminators for pianos, musical instruments, etc. Nom. cap.: £100. Dirs.: A. Knight, L. A. Clemence and J. R. York.

Elliott Electrical Stores Ltd., 95a Chancery Lane, W.C.2. Nom. cap.: £2. Buyers, sellers, importers, exporters, manufacturers of and dealers in apparatus for receiving and transmitting television, radio, telephonic and telegraphic communications, etc. Dirs.: not named. Subs: D. Wisdom and J. P. Medlicott, 28 Lincolns Inn Fields, W.C.2.

Co. Incorp. outside G.B. having established a place of business within G.B.

English Telephone Co., Ltd. Brit. add: Beresford House, Mount Pleasant, Alperton, Wembley, Middx. Regd. in Ireland on Sept. 15, 1954. Capital: £10,000. Names of persons authorised to accept service: C. Will, C. F. Finch and E. F. J. Perkins, of 39 Margaret St W.1.

Trade Notes

Changes of Address. The Hull branch of Enfield Cables Ltd. has been transferred to 23 Mytongate. Telephone, Hull 35018. The company's Edinburgh branch is now at 75 Hanover St. Telephone Edinburgh 31403.

The Belark Tool and Stamping Co., Ltd. have moved to 9 Carnaby St, London, W.1. Telephone Gerrard 2178.

New Branch. Permanoid Ltd. have opened a new branch at 14 Gibson St, Glasgow, W.2. Telephone Weston 2102. The branch will be under the control of Mr J. M. L. Morton.

MEETINGS TO NOTE

THURSDAY, 8 DEC.

BRITISH INSTN. OF RADIO ENGRS. (Scottish). "Automatic Control of Machine Tools." H. Ogden. 39 Elmbank Cresc, Glasgow, 7 p.m.

INSTN. OF WELDING (London). "Measuring Productivity in Welding—New Approach with Applications to Management." A. G. Thompson. 2 Savoy Hill, W.C.2, 6.30 p.m.

INCORP. PLANT ENGRS. (N. East). Film: "New Approach to Production Development," introduced by S. F. Smith, of Philips Electrical. Roadway Hse, Oxford St, Newcastle, 7 p.m.

I.E.S. (Cardiff). Report on 1955 meeting of International Commission on Illumination. E. N. Locker. Elect. Offices, The Hayes, 5.45 p.m.

I.E.E. (Swansea). "Thermionic Valves of Improved Quality for Govt. and Industrial Purposes." E. G. Rowe, P. Welch and W. W. Wright. Elect. Offices, The Kingsway, 6 p.m.

I.E.E. (N. Midland). "Atomic Energy and Electricity Supply." P. Mummery. Elect. Offices, Ferensway, Hull, 7.15 p.m.

I.E.E. (N. Scotland). "Design, Performance and Application of Miniature Circuit-Breakers." H. W. Wolff and T. G. F. Atherton. Queen's College, Dundee, 7 p.m.

A.S.E.E. (Southampton). "Employers' Liability." Robert Hughes. Polygon Hotel, 8 p.m.

FRIDAY, 9 DEC.

ROYAL INSTN. "Discovery of Useful Electricity." Sir Lawrence Bragg. Albemarle St, W.1.

I.E.E. (London Education). Discussion on "Aids to Teaching Subject of Windings in Rotating Machinery." F. Stefani. Savoy Place, W.C.2, 6 p.m.

I.E.E. (E. Midland). "Fuel Supplies of Future." D. Hicks. Leicester College of Technology, 6.30 p.m.

A.S.E.E. (Bristol). "Relays and Automatic Control in Industry." Dr W. L. Stern. Grand Hotel, 7.30 p.m.

A.S.E.E. (Stoke and Crewe). Films on Copper. N. Stafford Hotel, Stoke, 8 p.m.

ELECT. TRADES' COMMERCIAL TRAVELLERS' ASSOC. Annual Dinner and Smoker. Windsor Castle, Victoria, S.W.1, 6.30 p.m.

SATURDAY, 10 DEC.

A.S.E.E. Ladies' Night at Park Lane Hotel, Piccadilly, W.1, 6.30 p.m.

MONDAY, 12 DEC.

I.E.E. (London Radio). "The TV Studio as seen by the Producer." A. Rakoff. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (Mersey and N. Wales). "Electrical and Magnetic Measurements in Electrical Engineering Factory." D. Edmundson. Town Hall, Chester, 6.30 p.m.

I.E.E. (N. Eastern). "Electrical Measurement of Steam Turbine Rotor Movements, especially the Operation and Design of Modern Power Plant." J. L. Ashworth, J. S. Hall and A. H. Gray. Neville Hall, Newcastle, 6.15 p.m.

I.E.E. (Western). "Nuclear Power in its Application to Electrical Generation." T. E. Allibone. Reardon Smith Lecture Theatre, Cardiff, 6 p.m.

A.S.E.E. (Central London). Visit to Falks' lighting showrooms and meeting, 6.15 p.m.

A.S.E.E. (N.W. London). "Industrial Electronics for Industry." C. J. Teece. Century Hotel, Forty Ave, Wembley Park, 8.15 p.m.

IPSWICH ELECTRICAL ASSOC. Film Show. Electric Hse, 7.15 p.m.

SOC. OF ENGINEERS. Annual meeting at 17 Victoria St, Westminster, 5.30 p.m.

LEICESTER ELECTRICAL SOC. "Railway Electrification." J. R. Pugh. Elect. Offices, Charles St, 7 p.m.

BIRMINGHAM ELECTRIC CLUB. Brains' Trust. Grand Hotel, 6.15 p.m.

INSTN. OF WORKS MANAGERS (Manchester). "Atomic Energy as Applied to Industry." W. R. Corfield. Grand Hotel, 6.45 p.m.

I.E.S. (Leeds). "Studies in Interior Lighting." J. M. Waldram. 24 Aire St, 6.15 p.m.

TUESDAY, 13 DEC.

I.E.E. (N.W. Utilisation). "Electrical Installations in Automatic Chemical Plants." F. A. Richmond; "Thermal Storage Space Heating." J. Eddyshaw. Engineers' Club, Albert Sq, Manchester, 6.15 p.m.

I.E.E. (N. Ireland). "Proving Performance of Circuit-Breakers, especially those of Large Breaking Capacity," J. Christie, H. Leyburn and J. F. Bird; "New Testing Station for High-Power Circuit-Breakers," J. Christie, H. Leyburn and R. W. Fenn. Queen's Univ., Belfast, 6.30 p.m.

COVENTRY ELECTRIC CLUB. Electrical Quiz, Elect. Sports and Social Club, Merrick Lodge, St. Nicholas St.

INSTN. OF HEATING AND VENTILATING ENGRS. (Scottish). "Heating by Electricity." J. W. Moule. Building Centre, 425 Sauchiehall St, Glasgow, 7 p.m.

INSTN. OF HEATING AND VENTILATING ENGRS. (N. East). "Fan Types and Their Choice by the Heating and Ventilating Engineer." H. W. Brown. Inst. of Mining and Mech. Engrs., Neville Hall, Newcastle, 6.30 p.m.

I.E.S. (London). "Lighting in Buildings—Training and Practice." D. Phillips. 2 Savoy Hill, W.C.2, 6 p.m.

I.E.S. (Leeds). "Studies in Interior Lighting." J. M. Waldram. Young Peoples' Inst., 83-93 George St, Hull, 7 p.m.

WEDNESDAY, 14 DEC.

I.E.E. (London Supply). "Measurement of Steam Temperatures in Power Stations." D. H. Lucas and M. E. Peplow. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (N. Lancs). "Automatic Circuit Reclosers." G. F. Peirson, A. H. Pollard and N. Care. Elect. Offices, Darwen St, Blackburn, 7.15 p.m.

I.E.E. (Sheffield). "Electrification of Manchester-Sheffield-Wath Lines." J. A. Broughall and K. J. Cook. Grand Hotel, 6.30 p.m.

I.E.E. (Rugby). "Atomic Power Stations." D. F. Welch. College of Technology and Arts, 6.30 p.m.

I.E.E. (Southern). "Use of Transistors in Computer Type Circuits." G. B. B. Chaplin. R.A.E. Technical College, Farnborough, 7.30 p.m.

A.S.E.E. (Birmingham). Film Shows. Chamber of Commerce, New St, 7.15 p.m.

A.S.E.E. (York). "Use of Infra-red and U.V. Lamps." H. Laycock. Shambles Cafe, 7.15 p.m.

INSTN. OF ENGINEERING INSPECTION (Wolverhampton). "Electric Spark Machining." Mr Foster. Compton Grange, Compton Rd, 7.30 p.m.

INSTN. OF MECH. ENGRS. Paper on Nuclear Energy. 1 Birdcage Walk, Westminster, 5.30 p.m.

INSTN. OF HEATING AND VENTILATING ENGRS. (Yorks). "Electrical Circuits and Switchgear for the Heating Engineer." B. Davies. Griffin Hotel, Leeds, 7.30 p.m.

BRITISH INSTN. OF RADIO ENGRS. (London). "Remote Presentation of Radar Information." G. J. Dixon and H. H. Thomas. School of Hygiene, Keppel St, W.C.1, 6.30 p.m.

BRITISH INSTN. OF RADIO ENGRS. (W. Midlands). "TV Aerial Design, especially Band III Problems." I. A. Davidson. Technical College, Wulfruna St, Wolverhampton, 7.15 p.m.

BRITISH INSTN. OF RADIO ENGRS. (N. Eastern). "Metal Cone Loudspeakers." W. I. Heath. Neville Hall, Westgate Rd, Newcastle, 6 p.m.

INST. OF FUEL (E. Midlands), INCORP. PLANT ENGRS. "Grit and Dust Collection from Industrial Furnaces." J. E. O'Breen. County Hotel, Nottingham, 7 p.m.

INCORP. PLANT ENGRS. (Kent). Engineering Economics." T. S. Welch. Bull Hotel, Rochester, 7 p.m.

INSTN. OF MECHANICAL ENGRS. "Pressurised Water Reactor as Source of Heat for Steam Power Plants." J. M. Kay and F. J. Hutchinson. 1 Birdcage Walk, S.W.1, 5.30 p.m.

THURSDAY, 15 DEC.

I.E.E. (London Utilisation). "Intensification of X-ray Image in Industrial Radiology." A. Nemet and W. F. Cox. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (N. Lancs). "Automatic Circuit-Reclosers." G. F. Peirson, A. H. Pollard and N. Care. Elect. Offices, Finkle St, Kendal, 7.15 p.m.

I.E.E. (Irish). "Germanium Transistors." R. McCormick. Trinity College, Dublin, 6 p.m.

I.E.E. (E. Midland). Faraday Lecture: "Coal Mining Electrically." B. L. Metcalf. Albert Hall, Nottingham, 7.15 p.m.

I.E.E. (E. Anglia). Industrial Application of Radio-Active Isotopes." S. Jefferson. Assembly Hse, Norwich, 7.30 p.m.

I.E.E. (Southern). Annual dinner and dance. Polygon Hotel, Southampton, 7.30 p.m.

A.S.E.E. (Kent). Social evening at Highfield Hse, Maidstone, 8 p.m.

A.S.E.E. (Nottingham). A convivial evening at Cross Keys, Byard Lane.

A.S.E.E. (Watford). "A Day in the Life of a D.C.E." W. B. Askew. Clarendon Hotel, Station Rd, 8.15 p.m.

CHELMSFORD ENGINEERING SOC. "The Helicopter and Its Developments." Dr G. S. Hislop. Crompton's Hall, 7.30 p.m.

INST. OF FUEL (Mersey). "Instrumentation of Boiler." R. Clare. Liverpool Engineering Soc., The Temple, 24 Dale St, 7 p.m.

PURCHASING OFFICERS' ASSOC. (Birmingham). "Electronics and Automation." Grand Hotel, 7 p.m.

INCORP. PLANT ENGRS. (Blackburn). "Fabrication in a Modern Welding Shop." R. M. Watts. Golden Lion Hotel, 7.30 p.m.

I.E.S. (Manchester). "Fading and Related Effects associated with Radiation from Light Sources." B. S. Cooper. Elect. Offices, Town Hall Extension, 6 p.m.

FRIDAY, 16 DEC.

I.E.E. (Irish). 1954-55 Faraday Lecture: "Courier to Carrier in Communications." T. B. D. Terroni. Mansion Hse, Dublin, 8 p.m.

I.E.E. (N. Staffs). "Automatic Circuit Reclosers." G. F. Peirson, A. H. Pollard and N. Care. Elect. Offices, Stoke-on-Trent, 7 p.m.

E.P.E.A. (London). "Economics of Meter Maintenance." L. B. S. Golds. Caxton Hall, Westminster, 6.30 p.m.

I.E.S. (Birmingham). "Lighting Problems in Laboratories." P. S. Crowther and W. H. Pritchard. Regent Hse, St. Phillip's Place, Colmore Row, 6 p.m.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Apidictor. 745,172. Class 9. Apparatus for detecting and indicating conditions in bee hives. E. F. Woods, "Rayslepe," 91 Manor Rd South, Hinchley Wood, Surrey.

Portamatic. 744,960. Class 9. Wireless, telephonic, television instruments, etc. Dynaport Radio and Television Ltd., Portadyne Works, 30/34 Gorst Rd, N.W.10.

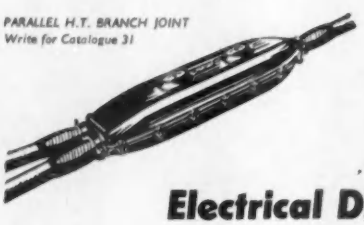
Speedicic. 742,236. Class 9. Measuring, indicating and recording instruments, etc. B.P.W. Instruments Ltd., Houseboat Works, Watling St, Radlett, Herts.

Wulco. 742,975. Class 9. Battery chargers. Cooper Wallace Ltd., 653a High Rd, N.12.

That the homely thrush, gladdest of garden songsters, is also in the distribution business has long been known to ornithologists. With his beak he carries seeds wherever he goes, and even when he "strops" his beak on a shrub or tree after lunch, the process of distribution is continued.

At HENLEY's, the process of electrical distribution is more recent but less haphazard. With strategically placed branches throughout the land—with time-tried equipment and considerable practical experience, HENLEY's offer to authorities and industries a reliable, comprehensive and speedy service.

PARALLEL H.T. BRANCH JOINT
Write for Catalogue 31



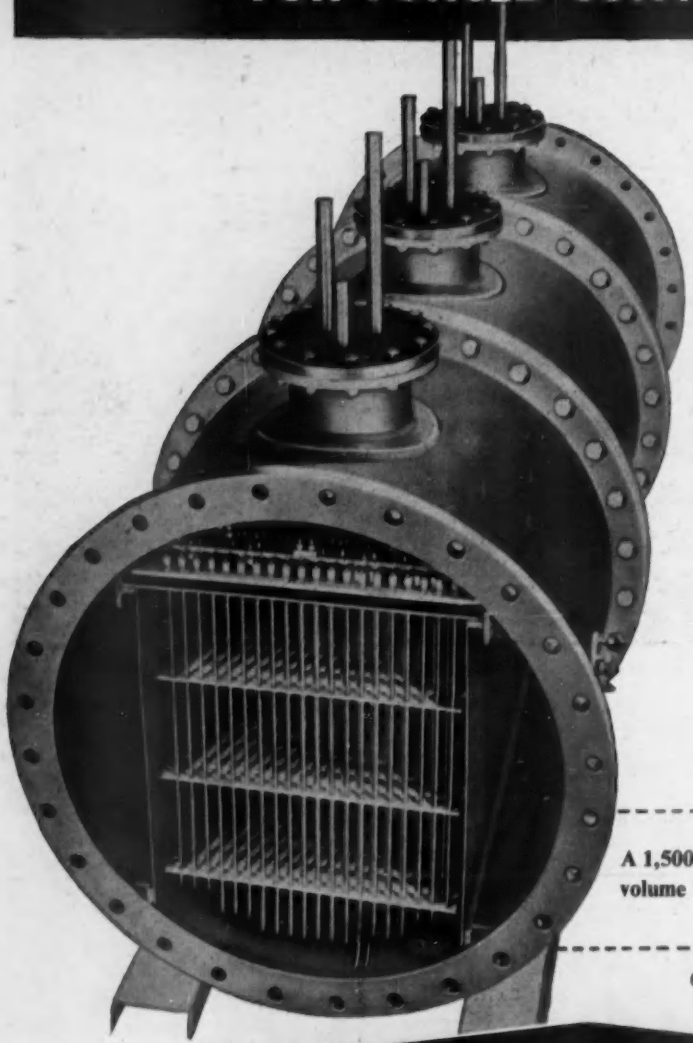
Electrical Distribution Equipment by HENLEY

W. T. HENLEY'S TELEGRAPH WORKS CO. LTD., 51-53 HATTON GARDEN, LONDON, E.C.1 CHAncery 6822

METROVICK

Tubular Sheathed Heating Elements

FOR FORCED CONVECTION HEATERS



Metrovick heating elements are ideally suited to the heating of gases under forced convection. Due to their special construction a rapid heat transfer from the elements to the surrounding gas is obtained and suitable ratings may be selected according to any specified gas-flow condition.

Metrovick tubular sheathed elements can be supplied in straight lengths in various ratings for incorporation in your own equipment.

We recommend that where the elements have to be bent to suit the contour of your product, as much preforming as possible should be done at our Works before dispatch.

Metrovick tubular sheathed elements will provide the heat just where it is required.

A 1,500-kW forced air heater for handling large volume at high temperatures and pressures.

Our technical staff will be pleased to advise you on your gas heating problems.

METROPOLITAN-VICKERS
ELECTRICAL CO LTD · TRAFFORD PARK · MANCHESTER, 17

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Making Things Hot for Industry

LA-906

CLASSIFIED ADVERTISEMENTS

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 32s. 6d. per inch, and all other classified advertisements at 2s. 6d. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

TENDERS INVITED

FEDERAL HYDRO-ELECTRIC BOARD OF RHODESIA AND NYASALAND

KARIBA HYDRO-ELECTRIC SCHEME

THE Federal Hydro-Electric Board propose to call for Tenders for the supply, delivery and erection of two 4-motor overhead electric travelling cranes required for Kariba Power Station. The approximate capacity of the main hoist of each crane will be 250 tons and of the auxiliary hoist 20 tons.

Contractors who may be interested in tendering for these cranes should submit full details of their qualifications and experience by 29 Dec., 1955, after which tender documents and drawings will be issued to those contracting organisations who satisfy the requirements of the Board.

Details of the qualifications and experience should be sent in duplicate to the Secretary, Federal Hydro-Electric Board, P.O. Box 630, Salisbury, Southern Rhodesia, with a copy to the Mechanical and Electrical Consulting Engineers, Merz and McLellan, Carliol House, Newcastle upon Tyne 1, England. (W 119)

EAST ANGLIAN REGIONAL HOSPITAL BOARD

CONTRACTS FOR ENGINEERING SERVICES

THE Board invite applications from competent engineering firms for inclusion in their approved list of contractors capable of executing new works and/or additions to existing hospital engineering services in the Region. The area administered by the Board includes Cambridgeshire, the Isle of Ely, Norfolk, Huntingdonshire, East and West Suffolk, the Soke of Peterborough and parts of South Lincoln and North Essex.

The classes of work and cost ranges into which the list is sub-divided are set out below:

Classes of work:

(*a*) Mechanical Engineering Services (including heating apparatus, hot and cold water, steam, kitchen and laundry installation, boiler installations, sterilising apparatus).
(*b*) Electrical installations and all auxiliary services.
(*c*) Sewage disposal plants.
(*d*) Lift installations.
(*e*) Cold storage and refrigeration.
(*f*) Well sinking and boring.

Cost range (for each class of work):

(i) Up to £500.
(ii) £500—£1,500.
(iii) £1,500—£5,000.
(iv) £5,000—£10,000.
(v) Over £10,000.

Firms desirous of being considered for inclusion in the list may obtain further details, on forms of application, by writing direct to the Board's Architect, 33 Parkside, Cambridge, not later than 17 Dec., 1955.

Firms already on the list need not re-apply unless they desire to amend the class(es) of work and cost range(s) for which they have been included. (W 130)

Box No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London, W.C.2

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD
Shin Project

11 KV INDOOR SWITCHGEAR AND ANCILLARY EQUIPMENT FOR SHIN POWER STATION, INVERAN, SUTHERLAND

TENDERS are invited for the supply and erection of the above-mentioned Switchgear. Tender Documents may be obtained on application with a cheque for £2. 2s. (returnable), to the Engineers, Messrs Kennedy and Donkin, 12 Caxton St, London, S.W.1. The Board do not bind themselves to accept the lowest or any Tender. H. W. Simpson, Secretary, North of Scotland Hydro-Electric Board, 16 Rothesay Terrace, Edinburgh, 3. (W 156)

ELECTRICITY (ESSENTIAL SUPPLIES) ACT (N.I.) 1954

CITY AND COUNTY BOROUGH OF BELFAST
(Electricity Department)

TENDERS are invited for the Supply Delivery and Erection at the Belfast Municipal Electric Power Station West, extensions of:

33 kV and Lower Voltage Cables and Accessories.

Form of Tender (N.1806), Conditions, Specification and Drawings, in quintuplicate, may be obtained from Messrs Merz and McLellan, Consulting Engineers, Carliol House, Newcastle upon Tyne 1, on payment of a deposit of Five Guineas which will be refunded provided a bona fide tender is lodged and not withdrawn. Extra copies of the tender document may be obtained at One Guinea each; this sum will not be returnable. Cheques should be made payable to the Belfast Corporation Electricity Department.

Each tender, in quadruplicate, in sealed envelope marked "Tender for 33 kV Cables, Electricity Department," and endorsed with the name and address of the tenderer must be addressed to the Town Clerk, City Hall, Belfast, so as to reach him not later than 4 p.m. on Thursday, 26 Jan., 1956.

An official receipt must be obtained for each tender delivered by hand. Tenders sent by post should be registered.

The lowest or any tender will not necessarily be accepted.

C. A. R. SHILLINGTON,
Chairman,
Northern Ireland Joint Electricity Committee.
Chichester House,
Chichester St,
Belfast.
30 Nov., 1955. (W 157)

BOROUGH OF HENDON

STREET LIGHTING EQUIPMENT
LANTERNS, COLUMNS AND WIRING

THE Borough Council invites tenders for all or any of the following:

(1) The supply, delivery and installation of lanterns for 140 W sodium lamps, together with transformers, condensers and other ancillary equipment.
(2) The supply and delivery to site of reinforced concrete lamp columns 25 ft to light source.
(3) The supply of labour and materials in connection with wiring and fixing lanterns and control gear.

All required in connection with the Improved Lighting of the Great North Way

continued in next column

continued from previous column

(A.1) (from junction with Watford Way to Finchley boundary).

The forms of tender, specifications and bills of quantities will be issued by, and Plan No. L.225 may be inspected at the offices of, the Borough Engineer and Surveyor.

Applications for the documents, stating the category or categories applicable, must be made to the Borough Engineer and Surveyor not later than Saturday, 17 Dec., 1955, accompanied by a deposit of £2. 2s., for each category in respect of which it is proposed to tender, which deposits will be returned on receipt of a bona fide tender on the form provided, and not subsequently withdrawn.

Tenders must be received by not later than 10 a.m. on Friday, 30 December, 1955, and no tender will be received except in a plain sealed envelope (provided), addressed to the Town Clerk, which shall bear the words "Tender for Street Lighting Equipment (Lanterns, etc.)," "Tender for Street Lighting Equipment (Columns)" or "Tender for Street Lighting Equipment (Wiring and Fixing)" as the case may be but shall not bear any name or mark indicating the sender.

In the case of the accepted tenders the deposit will be returnable on the execution, when required, of the contract and bond; failing such execution as aforesaid the deposit will be forfeited.

The Corporation does not bind itself to accept the lowest or any tender.

R. H. WILLIAMS,
Town Clerk.
Town Hall,
Hendon, N.W.4. (W 159)

CITY OF BELFAST

OUTDOOR STEPDOWN TRANSFORMERS

TENDERS are re-invited for the supply, delivery and erection of five 33/6·6 kV, 12,500 kVA Outdoor Stepdown Transformers with on-lead tap changing equipment.

Form of Tender (N.1736a), conditions, specification and drawings, in quintuplicate, may be obtained from Messrs Merz and McLellan, Consulting Engineers, Carliol House, Newcastle-on-Tyne 1, on payment of a deposit of Five Guineas which amount will be refunded provided a bona fide tender is lodged and not withdrawn. Extra copies of the contract document may be obtained at One Guinea each; this sum will not be returnable. Cheques should be made payable to the Belfast Corporation Electricity Department.

Each Tender, in quadruplicate, in sealed envelope marked "Tender for Outdoor Stepdown Transformers, Electricity Committee," and endorsed with the name and address of the tenderer, must reach the undersigned not later than 4 p.m. on Friday, 27 Jan., 1956.

An official receipt must be obtained for each tender delivered by hand. Tenders sent by post should be registered.

The lowest or any tender will not necessarily be accepted.

JOHN DUNLOP,
Town Clerk.
City Hall, Belfast,
P.O. Box 234.
2 Dec., 1955. (W 158)

APPOINTMENTS VACANT

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18–64, or a woman aged 18–59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

THE NORTH EASTERN ELECTRICITY BOARD
York Sub-Area

APPLICATIONS are invited for the appointment of SECOND ASSISTANT DISTRICT ENGINEER, Whitby District. Salary—Schedule A, Class C, Grade 7, £635/£680. N.J.B. Conditions of Service.

Applications stating age, qualifications and experience should be forwarded to the Secretary (Establishments), The North Eastern Electricity Board, G.P.O. Box No. 117, Carliol House, Newcastle upon Tyne 1, within ten days of the appearance of this advertisement. (W 139)

WAR OFFICE

VACANCIES exist for mechanical and electrical engineering draughtsmen in the designs branch of the Directorate of Fortifications and Works, War Office, Chessington, Surrey.

MECHANICAL DRAUGHTSMEN — (H and V)—applicants must have knowledge and experience of design of low-pressure hot water heating and domestic hot water supply installations. O.N.C. in Mechanical Engineering or equivalent is essential.

ELECTRICAL ENGINEERING DRAUGHTSMEN — applicants must have several years' experience in the preparation of schemes for the illumination and electrical equipment of buildings or in electrical distribution H.V. and M.V. O.N.C. in Electrical Engineering or equivalent is essential.

Applicants must be British of British parentage.

Salary range is £453 (at 21)/£710 plus overtime. Starting pay according to age, qualifications and experience, with annual increases subject to satisfactory service. Prospects of promotion and establishment. Canteen facilities.

State age, full details of training and experience to Secretary of State for War, War Office (C.5.D.) R.558 Northumberland House, London, W.C.2. (W 42)

HER MAJESTY'S OVERSEA CIVIL SERVICE

APPLICATIONS are invited for the following post:

ELECTRICAL ENGINEER
WORKS AND HYDRAULICS DEPARTMENT, TRINIDAD

Duties include design, planning and execution of electrical engineering works, and repair and maintenance of electrical installations, equipment, machinery and plant under the control of the Department, with responsibility for technical, financial and administrative control, and advising the Director of Works and Hydraulics on electrical engineering matters.

Appointment is on agreement for 3 years in first instance in the salary range £750/£1,250 per annum, point of entry dependent on qualifications and experience. A temporary and variable cost of living allowance is also payable on salaries up to £900.

Free passages for the officer, wife and up to 3 children under the age of 18. Quarters are not provided but allowance paid towards rent for private residence. Leave at the rate of 45 days a year.

Candidates must be Corporate Members or Graduates of the Institution of Electrical Engineers or in possession of an Engineering Degree or Diploma recognised as granting exemption from Sections A and B of the A.M.I.E.E. examination. They should have at least three years' post-graduate experience with a recognised electrical firm or undertaking.

Apply, in writing, to the Director of Recruitment, Colonial Office, Great Smith St, London, S.W.1, giving briefly age, qualifications and experience. Mention the reference number CDE 112/38/07. (W 121)

MIDLANDS ELECTRICITY BOARD

GENERAL ASSISTANT ENGINEER required in the Meter Department at the South Staffs and North Worcs Sub-Area Headquarters. Duties will include Laboratory work, sub-standard instrument calibration, testing of polyphase metering equipment, both in the Test Room and on Consumers' premises, and the carrying out of special tests on other apparatus, including switchgear and relays. Technical qualifications desirable.

Salary £515/£560 per annum (N.J.B. Grade L.18) Superannuable.

Apply by letter, within fourteen days, stating age, education, qualifications, experience, present position and salary to Mr T. G. Keeler, Sub-Area Manager (Ref. CW), Midlands Electricity Board, P.O. Box No. 9, Toll End Rd, Tipton.

A. STEPHENS,
Secretary.
(W 181)

GOVERNMENT OF QATAR (PERSIAN GULF)

ASSISTANT DISTRIBUTION ENGINEER

APPLICATIONS are invited for the appointment of an Assistant Distribution Engineer to assist the Distribution Engineer in the planning, construction and maintenance of H.T. and L.T. networks overhead and underground, substations, switchgear, etc., the supply voltage being 11 kV and 3·3 kV H.T. and 415/240 V L.T.

Candidates must be in possession of at least a Higher National Certificate in Electrical Engineering and preference will be given to those who hold an engineering degree or are Corporate Members of the Institution of Electrical Engineers. They should also preferably have had at least 10 years' experience with an electricity supply undertaking.

Terms and Conditions of Service:

Probationary period of six months during which the contract may be terminated at three months' notice by the Government.

Contract for five years subject to successful completion of probationary period. The employee may terminate the contract by giving three months' notice in writing.

The salary scale is from Rs. 1,775 per month rising by annual increments of Rs. 75 to Rs. 2,000 per month and then by increments of Rs. 100 to a maximum of Rs. 2,300 per month. (Present rate of exchange 1 rupee —1s. 6d.) The point of entry into the scale will be in accordance with the candidate's qualifications and experience.

A gratuity amounting to one month's salary for each completed year of service is payable on completion of contract only.

Free furnished accommodation, fuel, light and water. Married accommodation is provided after completion of probationary period.

Leave is earned at the rate of six days per completed month of duty and may be taken annually.

Free air or sea passages on first appointment, on leave and on final termination of contract are provided for applicant, wife and children up to 18 years of age.

An initial loan for the purchase of a car and running allowances are granted which fully cover the cost of running and depreciation.

Medical and dental treatment for the employee and his family are provided free.

A knowledge of Arabic would be an advantage and in any case the employee will be expected to apply himself to a diligent study of colloquial Arabic and to reach the standard of efficiency required by the Government regulations.

All calculations of pay and leave according to the Arabic Calendar in force in Qatar.

Applications endorsed "Assistant Distribution Engineer, Qatar," accompanied by full personal particulars including age, education, qualifications, experience, religion and past employment, should be made in writing, within 21 days of the date of this advertisement, to the undersigned.

PREECE, CARDEW AND RIDER.
8-12 Queen Anne's Gate,
Westminster, S.W.1. (W 171)

WEST MIDLANDS GAS BOARD
Walsall and District Division

DEPUTY DIVISIONAL ACCOUNTANT

APPLICATIONS are invited from qualified Accountants for the above position. Candidates should preferably have had extensive practical experience in the finance and accountancy of public utilities, including the preparation of Financial and Cost Accounts. The salary will be £1,000 x £50 —£1,200 per annum.

The post is pensionable and the successful candidate may be required to pass a medical examination.

Applications stating age, qualifications and experience, together with details of present and previous appointments and the names of two referees, should reach the Industrial Relations Officer, West Midlands Gas Board, 6 Augustus Rd. Edgbaston, Birmingham 15, not later than 19 Dec., 1955.

J. C. INGRAM.
Secretary to the Board.
(W 140)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments, which are superannuable and subject to medical examination:

FIRST ASSISTANT DISTRICT COMMERCIAL OFFICER required in each of the following Districts, under District Managers, in the Board's No. 4 Sub-Area:

Crewe District. Salary £790/£850 per annum (N.J.B. F.6).

Clwyd District (based on Rhuddlan). Salary £755/£800 per annum (N.J.B. E.6).

Duties include dealing with consumers' enquiries, correspondence, the preparation of estimates for installation and contracting work, Service Centre administration, and the general organisation of work of a commercial nature. Candidates should have good experience in this type of work, and possess suitable technical qualifications.

Application form obtainable from the Manager, No. 4 Sub-Area, Electricity House, Rhostyllen, near Wrexham. Closing date: 19 Dec., 1955.

SURVEYOR required in the No. 3 Sub-Area Engineering Department at Chester. Salary £510/£630 per annum (N.J.B. D.6).

Applicants should preferably have had experience on the construction of H.V. and L.V. overhead lines. Duties include field survey and plotting of results, preparation of profile drawings and pole and material schedules for overhead line work.

Application forms obtainable by written request from the Manager, No. 3 Sub-Area Electricity House, Newgate Street, Chester. Closing date: 19 Dec., 1955. (W 164)

INSTALLATION SUPERINTENDENT

required by Sierra Leone Government, Electricity Department, for two tours of 18 to 24 months. Appointment will be either (*a*) with prospect of pensionable employment with salary scale (including Expatriation Pay) £797 rising to £1,257 a year, or (*b*) on contract with salary scale £859 rising to £1,359 a year with gratuity up to £150 a year. Commencing salary according to age and experience. Outfit allowance £60. Free passages for officer and wife; also for two children, or grant up to £150 a year for their maintenance in U.K. Liberal leave on full salary. Candidates must have served an apprenticeship in the electrical maintenance section of a large works or in the consumers' section of an electricity undertaking and should hold an O.N.C. in Electrical Engineering or appropriate City and Guilds Certificate. They must have experience in the maintenance of motors and associated control gear up to 100 h.p., the installation of power and lighting circuits to comply with I.E.E. regulations, and the testing of single-phase motors. Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2A/28555/EE. (W 128)

SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for the position of ASSISTANT ENGINEER (Steam Plant Testing) in the Generation/Operation Section of the Chief Engineer's Department at Broomhill Drive, Glasgow.

Candidates should have a good technical education and preferably some experience of the testing and/or operation of Power Station plant. Knowledge of non-destructive methods of metal testing and/or instruments would be an advantage.

Salary—National Joint Board Agreement, Schedule C, Class AX/DX, Grade 6, £600/£785 per annum.

The position is superannuable. Application should be made on the standard application form, which may be obtained from the undersigned and returned not later than 23 Dec., 1955.

J. MEEK,
Secretary.
P.O. Box 173,
351 Sauchiehall St,
Glasgow, C.2.
1 Dec., 1955. (W 162)

CENTRAL ELECTRICITY AUTHORITY
East Midlands Division

APPLICATIONS are invited for the following positions within the Division:

THIRD ASSISTANT ENGINEER (MECHANICAL) CONSTRUCTION DEPARTMENT, DIVISIONAL H.Q.
Vacancy No. 215/55/ET

Applicants should have had a fundamental training in Mechanical Engineering including workshops and should preferably have had experience in the design, construction and operation of mechanical plant as installed in a modern Power Station.

A University Degree or equivalent qualification in mechanical engineering will be a recommendation.

Salary will be in accordance with Class AX/DX, Grade 4 (£750/£950 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications: 15 Dec., 1955.

ELECTRICAL MAINTENANCE ENGINEER CASTLE DONINGTON POWER STATION
Vacancy No. 214/55/ET

Technical qualifications to Higher National Certificate Standard in Electrical Engineering. Experience in maintenance of oil- and air-break switchgear, protective gear, plant control equipment and instrumentation.

Salary will be in accordance with Class L, Grade 6 (£1,110/£1,200 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications: 15 Dec., 1955.

SHIFT CHARGE ENGINEER BURTON POWER STATION
Vacancy No. 219/55/ET

A sound technical training and practical experience in the control and operation of steam generating plant and main switchgear are required. Appropriate qualifications an advantage.

Salary will be in accordance with Class E, Grade 7 (£715/£760 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications: 22 Dec., 1955.

These appointments will be pensionable within the terms and provisions of the Central Electricity Authority and Area Boards Superannuaion Scheme.

Applications should be submitted on the official form AE6/ACT which may be obtained from the Divisional Establishment Officer, Central Electricity Authority, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. Please quote Vacancy Number.

L. F. JEFFREY,
Divisional Controller.

2 Dec., 1955. (W 172)

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments. The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Northmet Sub-Area Headquarters

196/55.N.
SENIOR DRAUGHTSMAN

Candidates should have had experience in the preparation of system diagrams, underground and overhead mains records and overhead line designs, and should be conversant with general drawing office routine including the training of junior staff.

Salary—N.J.B. Schedule D, Grade 5 (£640/£740) plus London Allowance.

Apply, by letter, within 14 days, to the Manager, Northmet Sub-Area, Eastern Electricity Board, Northmet House, Southgate, London, N.14.

Chilterns Sub-Area, Hemel Hempstead District

183/55.R.
THIRD ASSISTANT ENGINEER

Candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground systems including Substations.

Salary—N.J.B. Class E, Grade 9 (£635/£680).

Apply by letter, within 14 days, to the District Manager, Eastern Electricity Board, 44 Marlowes, Hemel Hempstead, Herts. (W 182)

CENTRAL ELECTRICITY AUTHORITY
North West, Merseyside and N. Wales Division

VACANCY No. E.313/450/T.—MAINTENANCE ENGINEER (Mech.), Stockport Generating Station. Salary £790/£850 (F.6).

Vacancy No. E.313/451/T. — SHIFT CHARGE ENGINEER, Stockport Generating Station. Salary £755/£800 (F.7).

Vacancy No. E.313/454/T.—ASSISTANT SHIFT CHARGE ENGINEER, Bold Generating Station, near St. Helens. Salary £715/£760 (G.9).

Vacancy No. E313/458/T. — SHIFT CHARGE ENGINEER, Greenhill Generating Station, Oldham. Salary £715/£760 (E.7).

Vacancy No. E.313/459/T. — BOILER HOUSE SHIFT CHARGE ENGINEER, Bromborough Generating Station. Salary £755/£800 (H.9).

Vacancy No. E.313/460/T.—ASSISTANT SHIFT CHARGE ENGINEER, Westwood Generating Station, Wigan. Salary £715/£760 (G.9).

Vacancy No. E.313/463/T.—STATION SHIFT CONTROL ENGINEER, Bury Generating Station. Salary £595/£640 (E.10).

Applications to Divisional Secretary, Central Electricity House, 825 Wilmslow Rd, Manchester 20, before 17 Dec. Quote vacancy number. (W 148)

CITY OF LIVERPOOL EDUCATION COMMITTEE

COLLEGE OF TECHNOLOGY
Byrom St, Liverpool 3.

Principal:
E. G. Edwards, B.SC., PH.D., F.R.I.C.

APPLICATIONS are invited for the appointment of LECTURER in the Department of Electrical Engineering.

Salary: (Men) £965 x £25—£1,065 per annum (Burnham Technical Scale).

Applicants should possess good graduate qualifications in Electrical Engineering with practice in teaching to the standard of the Higher National Certificate or, preferably, to Higher National Diploma.

Industrial experience is desirable, preferably on the manufacture of electrical apparatus or electrical power.

Particulars of appointment and application forms, returnable by 29 Dec., 1955, may be obtained from H. S. Magnay, M.A., Director of Education, 14 Sir Thomas St, Liverpool 1.

THOMAS ALKER,
Town Clerk and Clerk to the Local Education Authority.

(J.4160). (W 169)

CENTRAL ELECTRICITY AUTHORITY
Midlands Division

SENIOR AND THIRD ASSISTANT ENGINEERS

APPLICATIONS are invited for one vacancy as SENIOR ASSISTANT ENGINEER and two vacancies as THIRD ASSISTANT ENGINEERS in the Operational Research Section of the Generation Operation Department. This is a new Section and the work involves investigation into the engineering activities of the Division. Particular attention will be paid to the examination and analysis of generating plant performance and to the study of methods of improving the economy and efficiency of operation.

A University Degree or Corporate Membership of a Senior Engineering Institution would be an advantage and in the case of the Senior Assistant Engineer who will be in charge of the section, candidates should preferably be fully-qualified engineers. Previous experience in Operational Research is desirable, but not essential, as there will be opportunities for training in the techniques.

Salaries will be according to N.J.B. Agreement, Schedule C, as follows:

Senior Assistant Engineer, Grade 1, commencing in range £1,100 to £1,225 and rising to £1,315. (Vacancy No. 156MD).

Third Assistant Engineer, Grade 4, commencing in range £750 to £875, rising to £950. (Vacancy No. 157MD).

Apply, quoting the vacancy number, on form AE6, available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 31 Dec., 1955. (W 153)

THE NORTH WESTERN ELECTRICITY BOARD

DISTRICT COMMERCIAL ENGINEER, NORTH WEST DISTRICT, ECCLES

DUTIES will include the organisation and control of all commercial staff and functions of the District; supply of information and advice to all classes of consumers on electricity utilisation, tariffs and all matters concerning electricity services; organisation and supervision of contract wiring work and maintenance services on consumers' premises; control of service centres, demonstrations, exhibitions, etc.; organisation and supervision of consumer records. Corporate Membership of the Institution of Electrical Engineers will be considered an advantage.

Salary Scale: £1,110 x £30—£1,200 per annum, Grade G.2, N.J.B. Conditions.

Applications to Sub-Area Secretary, No. 1 Sub-Area, The North Western Electricity Board, Town Hall, Manchester, P.O. Box 493, by 17 Dec., 1955.

DISTRICT SENIOR CLERK, BOLTON DISTRICT

The person appointed will be responsible for the supervision and carrying out of all clerical functions in the District.

Applicants should have had experience in secretarial practice, meter reading methods, costing, invoices, stores, salaries, wages and conditions of service, consumers' enquiries, records and accounts.

Salary Scale: £795 x £25—£870 per annum, Grade 6, N.J.C. Conditions.

FOURTH ASSISTANT DISTRICT ENGINEER, KEARSLEY DISTRICT

The duties will include the laying of L.V. distributors and services, and assisting in the construction, operation and maintenance of underground and overhead mains and substations including standby duties.

Applicants should state their experience in distribution work and possession of the H.N.C. in Electrical Engineering will be an advantage.

Salary Scale: £555 x £15—£600 per annum, Grade G.13, N.J.B. Conditions.

SENIOR SALES REPRESENTATIVE, LEIGH DISTRICT

Duties include advising consumers on supply matters, tariff queries, and apparatus sales for domestic and small commercial and industrial applications.

Experience in the application of electricity to agriculture and horticulture would be an advantage.

Applicants should possess the E.D.A. Sales Certificate and preference will be given to those who have taken courses of study in Electrical Engineering.

Salary Scale: £525 x £20—£585 per annum, Grade 2, N.J.C. Conditions.

Applications for the above posts to Sub-Area Manager, No. 2 Sub-Area, The North Western Electricity Board, 2 St. George's Rd, Bolton, by 17 Dec., 1955.

SENIOR SERVICE CENTRE ASSISTANT (MALE), BLACKBURN DISTRICT

Applicants should be of good address, have had a good general education, be experienced in the use of electrical appliances, and possess knowledge of electricity tariffs. Preference will be given to applicants who hold the E.D.A. Salesmanship Certificate and who are prepared to take approved courses of study in electrical engineering.

Salary Scale: £525 x £20—£585 per annum, Grade 2, N.J.C. Conditions.

Applications to Sub-Area Manager, No. 5 Sub-Area, The North Western Electricity Board, Jubilee St, Blackburn, by 17 Dec., 1955. (W 137)

SENIOR DIESEL ELECTRIC MECHANIC

required by the Falkland Islands Dependencies Administration for service at South Georgia in the South Atlantic for one tour of 30 or 36 months. Commencing salary according to age in the scale £400 rising to £540 a year. Free board and accommodation. Free passages. Leave on full salary. Candidates, unmarried, must be able to operate and maintain two 75 kW and one 25 kW Diesel Electric Generators and service all electrical equipment on the station. Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience, and quote M2A/41011/EE. (W 127)

YORKSHIRE ELECTRICITY BOARD

No. 4 (Leeds) Sub-Area

Leeds District

FOURTH ASSISTANT DISTRICT ENGINEER

APPLICANTS should be Graduates of the Institution of Electrical Engineers and have experience in the operation and maintenance and planning of overhead and underground distribution systems in a densely-populated industrial and residential area.

Salary—N.J.B. Class K, Grade 11, £755/£15/£900 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 4 (Leeds) Sub-Area, Yorkshire Electricity Board, Bramhope, near Leeds, not later than 22 Dec., 1955.

No. 7 (Grimsby) Sub-Area

THIRD ASSISTANT ENGINEER (OPERATION AND MAINTENANCE)

Candidates should be fully experienced in the operation and maintenance of H.V. and L.V. overhead and underground transmission and distribution systems, substation plant and ancillary equipment. They should be suitably qualified and hold at least the Higher National Certificate in Electrical Engineering.

Salary—N.J.B. Class H, Grade 10, £715/£15/£760 per annum.

THIRD ASSISTANT ENGINEER (DISTRIBUTION DESIGN)

Applicants should have experience in the design, construction, operation and maintenance of H.V. and L.V. overhead and underground distribution networks, substation plant and ancillary equipment. They should be suitably qualified and hold at least the Higher National Certificate in Electrical Engineering.

Salary—N.J.B. Class H, Grade 10, £715/£15/£760 per annum.

THIRD ASSISTANT ENGINEER (CONSTRUCTION)

Applicants should have experience in the design, construction, operation and maintenance of H.V. and L.V. overhead and underground distribution networks, substation plant and ancillary equipment. They should be suitably qualified and hold at least the Higher National Certificate in Electrical Engineering.

Salary—N.J.B. Class H, Grade 10, £715/£15/£760 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 7 (Grimsby) Sub-Area, Yorkshire Electricity Board, Moss Rd, Grimsby, not later than 22 Dec., 1955.

No. 5 (Wakefield) Sub-Area

Barnsley District

THIRD ASSISTANT DISTRICT ENGINEER

Applicants must have had a sound practical training and considerable experience in the construction, operation and maintenance of H.V. and M.V. Overhead and Underground Distribution Network, Substation Plant and Ancillary Equipment.

Applicants should hold a current driving licence, and be prepared to reside in the District and undertake standby duties.

Preference will be given to those who are Corporate Members of the Institution of Electrical Engineers, or who hold equivalent qualifications.

Salary—N.J.B. Class G, Grade 9, £715/£15/£760 per annum.

Doncaster District

THIRD ASSISTANT DISTRICT ENGINEER

Applicants must have had a sound practical training and considerable experience in the construction, operation and maintenance of H.V. and M.V. Overhead and Underground Distribution Network, Substation Plant and Ancillary Equipment.

Candidates must be prepared to reside in the District and undertake standby duties.

Preference will be given to those who are Corporate Members of the Institution of Electrical Engineers, or who hold equivalent qualifications.

Salary—N.J.B. Class F, Grade 9, £675/£15/£720 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 5 (Wakefield)

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Sub-Area, Yorkshire Electricity Board, 1a Denby Dale Rd, Wakefield, not later than 22 Dec., 1955.

No. 3 (Sheffield) Sub-Area

FOURTH ASSISTANT ENGINEER (CONSTRUCTION AND MAINTENANCE)

Applicants should hold the Higher National Certificate in Electrical Engineering, and should have had experience on electrical distribution, preferably on overhead line systems up to 66 kV, and/or on underground cable systems up to 33 kV. Both mains and substation experience is desirable.

Salary—N.J.B. Class M, Grade 13, £755/£15/£800 per annum.

Sheffield South District

FOURTH ASSISTANT DISTRICT ENGINEER

Applicants should hold the Higher National Certificate in Electrical Engineering and should have had experience in construction and maintenance work, and be able to carry out operation duties on 11 kV and L.V. overhead and underground mains in a district containing a heavy industrial and densely-developed residential area surrounded by a rural area.

Salary—N.J.B. Class H, Grade 11, £675/£15/£720 per annum.

Mexborough District

GENERAL ASSISTANT DISTRICT ENGINEER

Applicants should have had a good general and technical education up to Higher National Certificate standard with practical training in an engineering workshop or in the Electricity Supply Industry. The successful applicant will be engaged on the construction, operation and maintenance of H.V. and L.V. overhead and underground distribution. He will be required to reside in the district.

Salary—N.J.B. Class F, Grade 13, £515/£15/£560 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial St, Sheffield, not later than 22 Dec., 1955. (W 136)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

A VACANCY exists for a GENERAL ASSISTANT DISTRICT ENGINEER in the Peterhead District of the North Caledonia Area. Salary in accordance with N.J.B. F.9/F.7 £675/£800 with placing according to qualifications and experience.

Consideration will be given to applicants of little experience but with good technical background, to train for the above position. Salary to commence in the range N.J.B. F.11/F.10, £595/£680.

Superannuation Scheme applicable. Applications stating age, qualifications and experience to be forwarded to the Area Manager, West Villa, Elgin, Morayshire, by 19 Dec., 1955. (W 120)

CENTRAL ELECTRICITY AUTHORITY

North Eastern Division

APPLICATIONS are invited for the appointment of SECOND ASSISTANT ENGINEER in the Steam Testing Department with Headquarters at Dunston.

Applicants should be Corporate Members of the Institution of Mechanical or Electrical Engineers and should have previous plant testing experience.

The work of the successful candidate will be concerned ultimately with the investigation of thermal performance and operating characteristics of a wide variety of modern plant, following initial experience on Acceptance Tests of boilers, turbines and auxiliaries. A knowledge of power station operation will be considered an advantage.

The salary for the appointment (which is superannuable) will be in accordance with the National Joint Board Agreement, Schedule C, Grade 2 (£950/£1,165 per annum), and will commence at a point commensurate with qualifications and experience.

Forms of application may be obtained from Divisional Establishments Officer, Central Electricity Authority, North Eastern Division, Carliol House, Newcastle upon Tyne 1, to whom they should be returned to arrive not later than 2 Jan., 1956.

(W 160)

GOVERNMENT OF QATAR (PERSIAN GULF)

POWER STATION SHIFT ENGINEERS

APPLICATIONS are invited for the appointment of two Power Station Shift Engineers in the State Electricity Department in Doha. The system includes a central Power Station with two 200, two 400 and three 550 kW diesel alternator sets with switchgear and ancillary equipment and distribution system with overhead lines and underground cables operating at 11 kV, 3·3 kV and 415 V. Three further diesel alternator sets of 2,500 kW capacity each will be installed in the near future.

Candidates should hold an M.o.T. Certificate (Diesel) or equivalent qualification and must have had considerable previous experience in the operation and maintenance of large diesel engines.

Terms and Conditions of Service:

Probationary period of six months during which the contract may be terminated at three months' notice by the Government.

Contract for five years subject to successful completion of probationary period. The employee may terminate the contract by giving three months' notice in writing.

The salary scale is from Rs. 1,475 per month rising by annual increments of Rs. 75 to Rs. 1,700 per month (present rate of exchange 1 rupee—1s. 6d.). The point of entry into the scale will be in accordance with the candidate's qualifications and experience.

A gratuity amounting to one month's salary for each completed year of service is payable on completion of contract only.

Free furnished accommodation, fuel, light and water. Married accommodation is provided after completion of probationary period.

Leave is earned at the rate of six days per completed month of duty and may be taken annually.

Free air or sea passages on first appointment, on leave and on final termination of contract are provided for applicant, wife and children up to 18 years of age.

An initial loan for the purchase of a car and running allowances are granted which fully cover the cost of running and depreciation.

Medical and dental treatment for the employee and his family are provided free.

A knowledge of Arabic would be an advantage and in any case the employee will be expected to apply himself to a diligent study of colloquial Arabic and to reach the standard of efficiency required by the Government regulations.

All calculations of pay and leave according to the Arabic Calendar in force in Qatar.

Applications endorsed "Shift Engineer, Qatar," accompanied by full personal particulars including age, education, qualifications, experience, religion and past employment should be made in writing, within 21 days of the date of this advertisement, to the undersigned.

PREECE, CARDEW AND RIDER,
8-12 Queen Anne's Gate,
Westminster, S.W.1. (W 170)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the appointment of EDUCATION AND TRAINING OFFICER at the Headquarters of the Board, Love Lane, Liverpool 3. Salary within range £1,080/£1,200 per annum (N.J.C. Grade 9).

Candidates should have experience in the formulation and administration of industrial educational policy, and have knowledge of contemporary training methods, including Training within Industry and the national educational system.

Duties will include the preparation and direction of apprenticeships and training schemes for craftsmen, technicians and professional grades.

The appointment is superannuable and subject to medical examination.

Applications should be made on forms obtainable from the Establishment Officer at the above address. Closing date: 21 Dec., 1955. (W 168)

CENTRAL ELECTRICITY AUTHORITY
Research Laboratories, Leatherhead

require:

SECOND ASSISTANT ENGINEER, N.J.B. Grade 2, £925/£1,275.
THIRD ASSISTANT ENGINEER, N.J.B. Grade 3, £865/£1,075.
FOURTH ASSISTANT ENGINEER, N.J.B. Grade 4, £675/£850.
GENERAL ASSISTANT ENGINEERS, N.J.B. Grade 5, £475/£650.

The work covers a wide range of problems on generating plant, and present investigations include electrostatic precipitation, cooling towers, boiler feed pumps, etc. Candidates for the Second Assistant Engineer vacancy should have an Honours Degree, with previous industrial or research experience. For the other vacancies, either a Degree or Higher National Certificate is required, but previous experience is not essential.

Applications stating age, qualifications, experience, present position and salary to D. Moffat, Director of Establishments, Winsley St, London, W.1, to arrive not later than 30 Dec., 1955. Quote ref, AE. 710. (W 188)

ATOMIC ENERGY RESEARCH ESTABLISHMENT, HARWELL

invites applications for posts in its New Works Group, under the control of the Chief Architect.

(i) To work on the design of lighting and power installation in buildings, and L.T. Distribution schemes.
(ii) To work on the design of heating and ventilating installations in all types of buildings.

Applicants should have had at least three years' practical experience and, for (i) should possess an Ordinary National Certificate, or equivalent qualifications, in Electrical Engineering. For (ii) applicants should have passed sections A and B of the Associate Membership examination of the Institute of Heating and Ventilating Engineers or have obtained exemption therefrom. For both posts a wide knowledge of the duties outlined above, as well as some experience in the preparation of estimates, is desirable.

Salary will be assessed, according to age, qualifications and experience within one of the following scales:

Leading Draughtsman £743/£873 per annum
Draughtsman £478/£748 per annum
(For the senior post, correspondingly higher qualifications will be expected.)

Contributory superannuation scheme.

Send Postcard for application form to Establishment Officer, U.K. Atomic Energy Authority, A.E.R.E., Harwell, Didcot, Berks, quoting reference 457. (W 141p)

CENTRAL ELECTRICITY AUTHORITY
South Western Division

TECHNICAL STAFF VACANCIES

(*a*) STATION CHEMIST—Castle Meads Power Station. N.J.B. Class E, Grade 7, £715/£760.
(*b*) ASSISTANT ENGINEER (Electrical)—Hayle Power Station. N.J.B. Class F, Grade 10, £635/£680.

Superannuation.

Applicants.

For (*a*) should possess H.N.C. in Chemistry or equivalent, and have experience in the analysis of fuels, oil and water. They should also be familiar with modern methods of water treatment and boiler water control.

For (*b*) should have previous experience in electrical maintenance at Power Stations on H.V. and L.V. switchgear, motors, remote control and relay protective equipment. Candidates should be in possession of Higher National Certificate in Electrical Engineering.

Please note—previous applicants need not re-apply.

Applications on Form A.E.6/ACT, obtainable from the Division Secretary, 26 Oakfield Rd, Bristol 8, should be completed and returned by 31 Dec., 1955. (W 163)

THE ATOMIC WEAPONS RESEARCH ESTABLISHMENT
Aldermaston, Berkshire

requires

ENGINEERS AND TECHNICAL ASSISTANTS

Duties:

Posts A (Ref. 835/49) Engineers (Main and Basic Grade) and Technical Assistants are required for design work on specialised equipment required in Nuclear Physics and Reactor Physics research. The duties which offer scope for initiative and originality include:

(i) Co-operation with physicists in the design of Van de Graff and Cockroft Walton accelerators and associated equipment.
(ii) Responsibility for the design and operation of remotely-controlled machines required for experimental studies of fissile material.
(iii) Co-operation with physicists and industrial engineers in the design of a light water moderated research reactor and its associated facilities.

Posts B (Ref. 836/49) Engineers (Basic Grade) and Technical Assistants are required to assist with design development and manufacture of mechanical and electrical instruments and devices to the requirements of physicists and chemists engaged upon Radio Active measurement.

Qualifications and Experience:

Applicants should have served a recognised engineering apprenticeship and have, in addition, the following qualifications:

Engineer Posts.—Corporate Membership of the Institution of Electrical or Mechanical Engineers and appropriate experience.

Technical Assistants. Graduate Membership of the Institution of Electrical or Mechanical Engineers. Applicants should not be more than 32 years of age, although older men who have completed a regular engagement with the Armed Forces may be considered.

For Posts "B" experience of manufacturing techniques applied to electronic instruments would be a distinct advantage.

Salaries: Engineer (Main Grade) £1,130/£1,435 per annum; Engineer (Basic Grade) £728/£1,130 per annum; Technical Assistant £508/£873 per annum.

Contributory Superannuation Scheme. Married officers now living outside the Establishment's transport area will be eligible for housing on one of the Authority's estates, alternatively assistance towards legal expenses incurred in house purchase will be available. Until housed a lodging allowance may be payable.

Requests for application form by postcard to Senior Recruitment Officer at the above address, quoting the appropriate reference number. (W 129)

CENTRAL ELECTRICITY AUTHORITY
Research Laboratories, Leatherhead

require:

FOURTH ASSISTANT ENGINEERS Duties will include high-voltage and surge work, corona studies, dielectric testing and, generally, development and research work in the laboratory and field in connection with the transmission and distribution of electricity. Candidates should have a Degree or equivalent qualification preferably with some experience in one of the above subjects.

Salary N.J.B. Grade 4, £675/£850 per annum.

GENERAL ASSISTANT ENGINEER, to assist in dielectric testing, and development and research work in the laboratory and in the field in connection with the transmission and distribution of electricity. Candidates should possess Higher National Certificate or equivalent qualification.

Salary N.J.B. Grade 5, £475/£650 per annum.

Applications stating age, qualifications, experience, present position and salary, to D. Moffat, Director of Establishments, Winsley Street, London, W.1, to arrive not later than 30 Dec., 1955. Quote ref. AE.709. (W 165)

CENTRAL ELECTRICITY AUTHORITY
London Division

APPLICATIONS are invited for the following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A. Salary includes London Allowance. Qualifications entitling to Graduate Membership of the I.E.E. or I.Mech.E. an advantage.

BOILER HOUSE SHIFT CHARGE ENGINEER
BATTERSEA POWER STATION
Vacancy No. 55/988

Applicants should have experience of H.P. Boiler and pulverised fuel and have ability to control labour. Salary—Class L, Grade 9=£945 per annum.

SHIFT CHARGE ENGINEER
BLACKWALL POINT POWER STATION
Vacancy No. 55/989

Experience necessary in operation of modern H.P. turbine and boiler plant, preferably with P.F. firing. Salary—Class F, Grade 7=£792. 15s. per annum.

ASSISTANT SHIFT CHARGE ENGINEER
FULHAM POWER STATION
Vacancy No. 55/990

Applicants should have had a sound engineering training followed by experience with large up-to-date station plant. Salary—Class K, Grade 9=£882 per annum.

ASSISTANT ENGINEER (ELECTRICAL TESTING) FULHAM POWER STATION
Vacancy No. 55/991

Knowledge of testing and routine maintenance of Power Station electrical equipment, including generators, switchgear, transformers, motors and protective equipment. Salary—Class K, Grade 15=£624. 15s. per annum.

ASSISTANT ENGINEER (CONTROL)
HACKNEY POWER STATION
Vacancy No. 55/992

Applicants will be expected to undertake Control Room duties in the "A" Station Control, with responsibility for synchronising, load control, and the necessary switching operation. Salary—Class H, Grade 12=£666. 15s. per annum.

STATION SHIFT CONTROL ENGINEER
ST. PANCRAS POWER STATION
Vacancy No. 55/993

Sound technical training, experience of D.C. and operation of H.T. Switchgear. Salary—Class E, Grade 10=£624. 15s. per annum.

ASSISTANT SHIFT CHARGE ENGINEER
TAYLORS LANE POWER STATION
Vacancy No. 55/994

Applicants should have sound electrical knowledge in addition to experience in operation of modern High Pressure Boiler Plant. Salary—Class F, Grade 9=£708. 15s. per annum.

Applications, quoting vacancy number, may be made on form obtainable from Divisional Secretary, Central Electricity Authority, London Division, P.O. Box 136, Generation House, Great Portland St, W.1, and be received 14 days from the date of this advertisement. (W 142)

SOUTH EASTERN ELECTRICITY BOARD

GENERAL ASSISTANT ENGINEER
EASTBOURNE DISTRICT

SALARY £555/£600 per annum under N.J.B. Class E, Grade 11. Superannuable. Applicants should preferably hold the Higher National Certificate in Electrical Engineering or its equivalent, and have had practical experience in general distribution work on systems up to 11 kV.

Applications, naming two referees, on forms from J. E. Winborne, Eastbourne Manager, SEEBoard, Electric House, Grove Rd, Eastbourne, by 21 Dec., 1955.

A. L. BURNELL,
Secretary.
(W 155)

CENTRAL ELECTRICITY AUTHORITY
North West, Merseyside and N. Wales Division

VACANCY No. E.314/464/T. — STATION SHIFT CONTROL ENGINEER, Rawtenstall Generating Station. Salary £515/£560 (C.10).

Applications to Divisional Secretary, Central Electricity House, 825 Wilmslow Rd, Manchester 20, before 17 Dec. Quote vacancy No. Persons who applied under Vacancy No. 410 need not re-apply. (W 154)

CENTRAL ELECTRICITY AUTHORITY
Midlands Division

DEPUTY POWER STATION SUPERINTENDENT is required for Nechells "A" and "B" Power Stations. N.J.B. service conditions, superannuable appointment, salary in accordance with Schedule A, Grade K.3, £1,295/£1,400 per annum.

Candidates should have a wide experience in the operation and maintenance problems of a large modern power station, and should have sound administrative ability. The possession of a University Degree in Engineering or Corporate Membership of the Institution of Electrical or Mechanical Engineers will be an advantage.

Apply, quoting Vacancy No. 158MD on Form A.E.6 available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 20 Dec., 1955. (W 152)

CENTRAL ELECTRICITY AUTHORITY
Research Laboratories, Leatherhead

require in the Electronics and Instruments Section:

SECOND ASSISTANT ENGINEERS to be responsible for carrying out experimental testing and development work in the laboratory and in the field. Two vacancies exist and candidates should have a good Honours Degree, sound theoretical knowledge and a wide practical experience in one of the following fields: (*a*) protective systems, relays, control gear and similar devices as employed in the Central Authority's or the Electricity Board's systems; (*b*) analogue or digital computing equipment and techniques, servo system design, etc. for the development of automatic control systems.

Salary N.J.B. Grade 2, £925/£1,275 per annum.

FOURTH ASSISTANT ENGINEERS to assist in carrying out experimental testing and development work in the laboratory and in the field. Candidates should have a Degree or equivalent qualifications and ability to apply fundamental knowledge to a variety of problems.

Three vacancies exist, and some experience in one of the following fields would be an advantage: (*a*) Electronic instrument and communications circuit design, prototype construction and testing work; (*b*) Noise, vibration and harmonic measurement; calibration of equipment and analysis of experimental data; (*c*) Field strength and voltage measurements at radio frequencies, calibration of equipment and analysis of experimental data.

Salary N.J.B. Grade 4, £675/£850 per annum.

Applications stating age, qualifications, experience, present position and salary to D. Moffat, Director of Establishments, Winsley St, London, W.1, within 14 days. Quote ref. AE/708. (W 166)

MECHANICAL AND ELECTRICAL ENGINEERS
IN VARIOUS GOVERNMENT DEPARTMENTS

THE Civil Service Commissioners invite applications for pensionable posts in a wide variety of mechanical and electrical engineering duties.

Candidates must be under 35 on 1 Jan., 1955, with extension for regular service in H.M. Forces and up to two years for permanent civil service. For the Post Office they must be at least 21, for the Ministry of Supply, and Ministry of Transport and Civil Aviation (Civil Aviation Organisation) at least 23; for other posts at least 25 on that date.

Generally a candidate must possess a University degree in Engineering or be a Corporate Member of one of the professional Institutions—Mechanical Engineers, Electrical Engineers, or Civil Engineers, or have passes in, or exemption from, Section A or I and B or II of the corresponding Associate Membership examinations. Exceptionally candidates of high professional attainment, but without the specified qualifications, may be admitted. For some posts Associate Fellowship of the Royal Aeronautical Society or an Honours degree in Physics or Engineering will be accepted.

London salary (men) £705 (at age 25) to £1,095. Starting salary according to age up

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to £970 at 34. Candidates entering below age 25 will start at salaries varying from £493 at age 21 to £625 at age 24. Prospects of promotion. Salaries of next higher grades are £1,095/£1,415 and £1,470/£1,595. Somewhat lower in the provinces. Women's scales lower but being improved under equal pay scheme.

Further particulars and application forms from Civil Service Commission, Scientific Branch, 30 Old Burlington St, London, W.1, quoting No. S85/55. Completed applications to be returned by 31 Dec., 1955. (W 143)

LONDON ELECTRICITY BOARD
ENGINEERING DRAUGHTSMEN

APPLICATIONS are invited for the following vacancies:

St. Marylebone/St. Pancras District (Ref.: PER/V/2092/T)

Applicants should have had a good general and technical education in electrical engineering and building construction, and experience in mains records office dealing with systems of all voltages up to 11 kV.

Southern Sub-Area, based at Beckenham, Kent (Ref.: PER/V/2068/T)

Candidates should have a good general and technical education up to Ordinary National Certificate standard, be neat and capable draughtsmen and experienced in one or more of the following subjects: Drawing office routine, electrical diagrams, layout of plant in transformer chambers, mains survey and recording of mains work.

Western Sub-Area, based in Central London (Ref.: PER/V/2064/T)

Candidates should have a good general and technical education and be experienced in drawing office routine, electrical diagrams, mains survey and recording of mains work and layout of plant in transformer chambers.

Chief Engineer's Department, Drawing Office Central London (Ref.: PER/V/1989/T)

Applicants should preferably have served an engineering apprenticeship and have had technical training to Ordinary National Certificate level, together with experience in the layout of transforming plant, H.V. Switchgear and cables.

These permanent and superannuable posts are graded under Schedule D of the National Joint Board agreement as Grade 6, £535. 10s. /£661. 10s. per annum, inclusive of London Allowance.

Application forms obtainable from Personnel Officer, 46/7 New Broad St, London, E.C.2. Please quote appropriate Ref. No. of vacancy preferred, as indicated above. (W 45)

COUNTY BOROUGH OF CROYDON
ELECTRICAL ENGINEERING STAFF

APPLICATIONS are invited for the following appointments:

(*a*) STREET LIGHTING ENGINEER. Commencing salary according to experience, progressing by annual increments of up to £70, to a maximum of £1,030 per annum.

(*b*) ELECTRICAL ENGINEERING ASSISTANT. Commencing salary according to qualifications, progressing by annual increments of up to £50, to a maximum of £805 per annum.

For particulars and application form write to: Borough Engineer, Town Hall, Croydon.

Applications to be returned to the Borough Engineer not later than Tuesday, 3 Jan., 1956. (W 135)

CENTRAL ELECTRICITY AUTHORITY
Midlands Division

FOURTH ASSISTANT ENGINEER is required in the Protective Gear Section of the Technical Department. N.J.B. service conditions, superannuable appointment, salary within Schedule C, Grade 6, commencing in range £600/£725, ultimately rising to £785 per annum.

A University Degree, Higher National Certificate or equivalent qualification is desirable. Some knowledge of protective gear is required, and preferably experience with a switchgear manufacturer.

Apply, quoting Vacancy No. 153MD, on Form A.E.6, available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 31 Dec., 1955. (W 151)

EAST ANGLIA REGIONAL HOSPITAL BOARD

DEPARTMENT of the Regional Architect (Guy Addis, A.R.I.B.A., A.A.DIPL.) for planning of a scheme for the major development of a General Hospital which the Board is about to undertake.

(1) ASSISTANT ENGINEER (Mechanical) —Candidates to be experienced in design and installation of heating, ventilating, steam boiler plant and services, etc., and should be A.M.I.H.V.E., or Graduate Members of I.H.V.E., or equivalent. Salary £640/£930 per annum.

(2) ASSISTANT ENGINEER (Electrical) —Candidates to be experienced in design and installation of electrical engineering services and should be A.M.I.E.E., or Graduate Members of I.E.E., or equivalent. Salary £640/£930 per annum.

(3) ENGINEERING ASSISTANTS — Candidates to be experienced in work described above and possess Ordinary National Certificate (Mechanical or Electrical). Salary £480 (at age 21 or over)—£670 per annum.

(4) DRAUGHTSMEN (Engineering) — Candidates to have had suitable training and experience. Salary £390 (at age 21 or over) —£580 per annum.

Additional increments within the scale based on experience and age may be granted in respect of posts (1) and (2). Commencing salary for post (3) may be fixed at point above minimum but will not exceed £560 per annum.

Applications indicating appropriate post and stating age, qualifications, experience and details of present position with names of three referees to Secretary of Board, 117 Chesterton Rd, Cambridge, by 23 Dec., 1955. (W 126)

CENTRAL ELECTRICITY AUTHORITY
Eastern Division

APPLICATIONS are invited for the following appointment:

ENGINEERING DRAUGHTSMAN
LITTLE BARFORD GENERATING STATION

Salary N.J.B., Schedule D, Grade 6, £510 x £20—£630 per annum.

Applicants should possess a sound general and technical education. Preference will be given to those with experience in Mechanical and/or Electrical equipment associated with a modern Generating Station.

Applications stating age, details of qualifications and experience, should be sent to the Controller, Central Electricity Authority, Eastern Division, Northmet House, Southgate, N.14, not later than 17 Dec., 1955.

W. N. C. CLINCH,
Controller.
(W 138)

SOUTH WESTERN ELECTRICITY BOARD
FIRST ASSISTANT DISTRICT COMMERCIAL ENGINEER—EXETER

SALARY N.J.B. Class E, Grade 6—£755/£800 per annum.

The successful candidate will generally assist the District Commercial Engineer and deputise in his absence.

Duties include the initiation of development schemes, the conduct of sales and publicity campaigns, the preparation of detailed wiring estimates, the organisation of installation contracting and the supervision and co-ordination of detailed work in the Service Centres. Qualifications leading to Corporate Membership of the I.E.E. desirable.

Application forms obtainable from the District Manager, 46 North St, Exeter, are returnable by 20 Dec. (W 184)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD
Aberdeen Area

THERE will shortly occur a vacancy for a SHIFT CONTROL ENGINEER. N.J.B. Grade F/10 (£635 x £15—£680).

Applicants should have control experience and preferably hold a Higher National Certificate. Applications should be made within 14 days on a form to be obtained from me. The position is superannuable.

J. E. WHITTAKER,
Area Manager.
Area Offices,
Millburn St, Aberdeen. (W 167)

CENTRAL ELECTRICITY AUTHORITY
North Eastern Division

require ASSISTANT STATION SHIFT CONTROL ENGINEERS for Control Room duties at Carville Power Station, Wallsend. This position is the normal entry for staff into the Electrical Control Rooms of the Power Stations in the Tyneside Areas and there are good prospects of advancement to larger stations. Applicants should have had a sound education and an apprenticeship or practical training suitable to the requirements of the Electrical Supply Industry. The possession of an Ordinary or Higher National Certificate in Electrical Engineering or equivalent qualifications is also desirable. The commencing salary for Carville Power Station is £555 per annum and these appointments are superannuable. Applications in writing to the Divisional Establishments Officer, Central Electricity Authority, North Eastern Division, Carliol House, Newcastle upon Tyne, 1, to arrive not later than 31 Dec., 1955. (W 161)

A COMPANY manufacturing power plant requires a TURBINE SPECIALIST SALES ENGINEER. Substantial starting salary and non-contributory superannuation. The person appointed will be responsible, after a period of training in the Company's products, for the sales of turbines at home and abroad. Previous Home and Overseas selling and operating experience is desirable and ability to discuss power problems with Consulting Engineers and Users essential. Experience in design and manufacture of turbines and of commercial aspects is required. Residence in the United Kingdom would normally be necessary but overseas tours will be frequent. Please apply to the Chief Personnel Officer, Brush Electrical Engineering Co., Ltd., Loughborough, Leics. (W 185)

A VACANCY arises for a PROFESSIONAL ENGINEER in the Education Dept. of the Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester 17. The selected candidate will join the staff responsible for the recruitment, selection and training of men on professional engineering and scientific training courses organised by the company. He will be required to control training programmes and be personally responsible for a number of men in training from Universities and Public and Grammar Schools. Candidates should have a degree in Mechanical or Electrical Engineering or an equivalent qualification and should have had previous engineering experience. Previous experience in educational and training work is an advantage, but not essential. Ex-officers of H.M. Forces with industrial experience would have favourable consideration. The minimum age of a candidate should be 30 years and the maximum 40 years.

Applications with full details and salary required (which would be appropriate to qualifications) should be submitted to Manager, Education Department, Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester 17. (W 122)

ASSISTANT ELECTRICAL ENGINEER wanted aged 25-35. Applicant should be conversant with plant lay-outs, schematic diagrams of connections, machine wiring and connection diagrams, ordering of electrical material and should have experience in draughtsmanship and at least National Certificate or equivalent in Electrical Engineering. Permanent position with pension scheme. Housing available.

Apply to Distington Engineering Company Limited, P.O. Box No. 8, Workington, Cumberland, giving particulars of experience and salary required. (W 149)

ASSISTANT WORKS MANAGER required for new factory at Crawley, Sussex, engaged on Transformer manufacture up to 100 kVA and light electrical control equipment. Essentially a good disciplinarian. House available if required. A progressive situation offering good scope for a keen person. Full details to—Box No. 5003, Electrical Times. (W 20)

SCIENTISTS, ELECTRONIC AND MECHANICAL ENGINEERS

Interesting and varied Development Work with a firm small enough for you to be of individual importance, and not just a link in the chain.

NASH AND THOMPSON LTD. have an expanding programme of work on scientific instruments and equipment, and invite enquiries from lively minded Scientists and Engineers (Mechanical and Electronic) who are interested in an Industrial career.

Write and tell us about yourself, and the sort of work you like doing. Perhaps we have just the job for you.

NASH AND THOMPSON, LIMITED,
Oakcroft Road, Chessington, Surrey.
Telephone: ELMbridge 5252. (W 150p)

AN ENGINEER REPRESENTATIVE is required in the East Midlands by Wm. Sanders and Co. (Wednesbury) Ltd., for the sale of their Switchgear, Fuse Distribution Gear and Accessories. Applicants should have sound electrical knowledge and sales experience. A connection among Users, Contractors, Consultants and Wholesalers in the area is desirable. Car provided. Full details to Sales Manager, Wm. Sanders and Co. (Wednesbury) Ltd., Ridding Lane, Wednesbury. (W 144)

BRITISH PETROLEUM CO., LTD., has a vacancy at its London Office for an ELECTRICAL ENGINEER. Applicants under 35 years must have had a thorough works training and responsibility for the lay-out, development, specification and design of power networks, covering both overhead and underground systems from 33 kV to low voltage. Candidates should have an Engineering Degree, and be Corporate Members of the Institution of Electrical Engineers. Experience in the layout of large industrial installations, including small power and lighting, is essential and with flameproof equipment an advantage. Salary according to age, qualifications and experience. Non-contributory Pension Scheme. Luncheon Club. Write, giving full particulars, quoting H.3518, to Box 8365, c/o 191 Gresham House, E.C.2. (W 123)

BRITISH CELANESE LTD. require TWO ELECTRICAL DRAUGHTSMEN at their Spondon works. Applicants should have had experience preferably in the chemical or oil refinery industries and be fully conversant with the layout of high and low voltage switchgear, cable networks, power and lighting installations for chemical plants, and diagrams for automatic control and protective equipment. Good conditions are offered, and there is a contributory pension scheme and free life insurance. Please reply giving full details to the Appointments Officer, British Celanese Ltd., Spondon, Nr. Derby. (W 47)

ENGLISH ELECTRIC CO., LTD., STAFFORD

Applications are invited for the appointment of Chief Instrument Design Engineer, to take complete responsibility for the development and design of the Company's range of electrical indicating instruments.

The Company is prepared to consider engineers not necessarily with specialist electrical instrument experience provided they have experience in development and design for competitive manufacture of kindred mechanical or electro-mechanical devices.

Attractive unfurnished house is available, also early admission into the Company's Staff Pension Scheme.

Applications, which will be treated in confidence, should be addressed to Dept. C.P.S., 336/7 Strand, W.C.2, quoting Ref. 1366C. (W 146p)

BRITISH Engine Boiler and Electrical Insurance Co., Ltd., 24 Fennel St, Manchester 4. The Company requires additional ELECTRICAL PLANT INSPECTORS in England and Scotland (Kilmarnock/Ayr). Permanent positions carrying progressive salary scale £600/£850 and non-contributory pension. Candidates age 26 to 30 years with apprenticeship in the manufacture or repair of electrical machinery and preferably with subsequent experience of industrial use of electrical machinery, and who have gained the Higher National Certificate in Electrical Engineering or are Graduates of the Institution of Electrical Engineers, are invited to apply in own handwriting stating age, qualifications and experience. (W 179)

CABLE JOINTING. Progressive firm in South has opening for DESIGN AND DEVELOPMENT ENGINEER with experience of modern methods of cable jointing. Write, in confidence, stating age, salary required and experience, to Managing Director —Box No. 5063, Electrical Times. (W 131)

CHIEF DESIGNER required by Northern Transformer manufacturers, to be fully responsible for design and manufacture of both medium and large Transformers. Experience on Voltage Regulators and On-load Tap Change Gear an advantage. Successful applicant must have operated in a similar capacity and be capable of controlling staff. Salary £1,500/£2,000 per annum according to experience and qualifications. Also required SENIOR DESIGNER with similar experience. Salary £1,100/£1,500 per annum. —Box No. 5035, Electrical Times. (W 33)

ELECTRICAL CONTRACTORS engaged on industrial work in the Wolverhampton area require an experienced Estimator. Apply—Box No. 5043, Electrical Times. (W 74)

ELECTRICAL FITTER required at Central Electricity Authority Research Laboratories, Leatherhead. Duties will include maintenance of high-voltage test plant, wiring of test equipment, etc. Experience in distribution or transmission installations is desirable. Wages and working conditions in accordance with N.J.I.C. Agreement, i.e. 4s. 1d. per hour for a 44-hour, 5-day week. Voluntary pension scheme after qualifying period. Applications in writing to D. Moffat, Director of Establishment, Winsley St, London, W.1. Quote ref. AE/711. (W 189)

THE SPENCER WIRE CO., LTD., Wakefield

invite applications for the position of Copper Wire Drawing Mill production Manager. The post is pensionable. Applications in confidence to be made to the Managing Director and should give age and very full details of experience and salary required. P.O. Box 14, Wakefield. (W 24p)

VENNER LIMITED

require

ELECTRICAL ENGINEERS/LABORATORY ASSISTANTS with experience in development of electro-mechanical instruments. Time-Switch experience an advantage.

Salaries and conditions for these Staff vacancies are attractive and there is a Pension scheme. Applications should be addressed to the Personnel Manager

VENNER LIMITED,
New Malden, Surrey.
(MALden 2442)
(W 53p)

ELECTRICAL Wholesalers require an experienced ORDER OFFICE CLERK and a competent STOREMAN. Top rates of pay available to men with the right kind of experience, employment to commence Jan. Applications for either position to be made in writing to Managing Director, E. Dawson (Lamp Factors) Ltd., 10 Grays Inn Rd, London, W.C.1. (W 133)

ELECTRICAL FITTER required by the Central Electricity Authority at Nottingham Transmission Section. The work includes the overhaul of existing 132,000 V transmission equipment and in the future 275,000 V transformers and switchgear.

Previous experience of H.V. equipment essential. Rate of pay 49d. per hour, 44-hour week. Terms and conditions of service in accordance with the N.J.I.C. Agreement.

Applications in writing stating age and experience to Divisional Controller, Central Electricity Authority, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham, quoting Vacancy No. 205/55/ET. (W 173)

ELECTRICAL FITTER required by the Central Electricity Authority at Coventry Transmission Section. The work includes the overhaul of existing 132,000 V transmission equipment and in the future 275,000 V transformers and switchgear.

Previous experience of H.V. equipment essential. Rate of pay 49d. per hour, 44-hour week. Terms and conditions of service in accordance with the N.J.I.C. Agreement.

Applications in writing stating age and experience to Divisional Controller, Central Electricity Authority, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham, quoting Vacancy No. 206/55/ET. (W 174)

BACKER ELECTRIC CO., LTD., ROTHERHAM, YORKSHIRE

Manufacturers of Tubular Sheathed Heating Elements for Domestic and Industrial Applications,

REQUIRE:

(1) Senior Research Engineer with scientific (physics, chemistry and applied electricity) qualifications and sound experience.

Duties to include:
Charge of new laboratory, improvement of products, research in new fields of application.

(2) Sales Engineer, technically qualified, not over 40, experienced, willing to travel.

Applications, which will be treated in confidence, to the Secretary. (W 109p)

ENGLISH ELECTRIC CO., LTD., STAFFORD

Vacancies exist for DEVELOPMENT ENGINEERS and DEVELOPMENT TEST ENGINEERS with either Electrical or Mechanical engineering qualifications at least equivalent to H.N.C., to undertake development on heavy electrical rotating machines, rectifiers, switchgear and transformers; up-to-date knowledge of relevant manufacturing methods is required and previous experience of development testing is a desirable qualification.

The duties involve directing, in close collaboration with design departments, the development of prototype equipment and the undertaking of some fundamental investigations.

One of the Mechanical Engineers may later have the opportunity of taking charge of a new comprehensive Mechanical Testing Laboratory.

These positions are all permanent, progressive and pensionable.

Applications, which will be treated in strict confidence, should be addressed to Dept. C.P.S., 336/7 Strand, W.C.2, quoting Ref. 1420. (W 108p)

FITTER required by the Central Electricity Authority at Coventry Transmission Section. Rate of pay 49d. per hour, 44-hour week. Terms and conditions of service in accordance with the N.J.I.C. Agreement.

Applications in writing stating age and experience to Divisional Controller, Central Electricity Authority, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham, quoting Vacancy No. 207/55/ET. (W 175)

GERMANIUM Power Rectifiers—ENGINEER is required to assist in development and design of rapidly expanding line. Previous rectifier experience not necessary, but applicants should have Degree or approximate equivalent, and some works experience. Excellent residential and educational district. Write, with full particulars, to Manager, Rectifier Engineering Department, British Thomson-Houston Co., Ltd., Rugby. (W 34)

GRADUATES in Maths, Physics or Engineering are required for research and development work in telecommunications. They will be offered opportunities for advance to senior executive appointments. Pension scheme. Applications which will be treated in the strictest confidence to ACTM, Southern United Telephone Cables Limited, Dagenham Dock, Essex. (W 97)

JUNIOR TECHNICAL ASSISTANT required by London Chartered Patent Agents with a view to training for qualifying as a Patent Agent. Degree standard in electrical engineering desirable. Write giving details of age, experience, etc., to—Box No. 8813, c/o White's Ltd., 72/78 Fleet St, E.C.4. (W 76)

ELECTRICIANS

Several Electricians required on Aircraft installation work. Although previous experience on modern aircraft is desirable—applications are welcome from Naval and R.A.F. electricians. All men who are capable of high class installation work are invited to apply. Good rates and all facilities. Call or write: Personnel Officer, Hawker Aircraft Limited, Sutton Lane, Langley (near Slough), Bucks. (W 48p)

NORTHERN IRELAND

Electrical Manufacturers require Senior Designer Draughtsmen with experience medium and large synchronous machines and induction motors for Industrial and Marine use, also draughtsmen experienced on similar size D.C. machines. Must be able to work with minimum of supervision. Five-day week in operation. State fully, experience, age and salary, to—Box No. 5069, Electrical Times. (W 183p)

JUNIOR DESIGN DRAUGHTSMAN for automatic motor control gear. Good opportunity for young man, permanent position with five-day week—contributory pension scheme. Write giving full particulars of experience and salary. British Klockner Switchgear, Chertsey, Surrey. (W 30)

LEWIS'S LTD. have a vacancy for a DRAUGHTSMAN in their Engineering Department. Applicants should write giving details of their experience and salary required, to—The Consulting Engineer, Lewis's Ltd., 40 Ranelagh St, Liverpool 1. (W 186)

MANAGER required for Transformer manufacturing department. Should have all round experience, including design. Burnley District. Accommodation available. —Box No. 5055, Electrical Times. (W 105)

PHYSICIST required with degree or H.N.C. for work on Magnetic Materials. Reply, stating age, qualifications and salary required to S.E.I. Ltd., Times Mill, Heywood. (W 132)

PRODUCTION MANAGER for light electro mechanical and switchboard work. N.E. Lancs. Accommodation available.—Box No. 5053, Electrical Times.. (W 104)

PRODUCTION MANAGER with general machine shop experience. N.E. Lancs. accommodation available.—Box No. 5051, Electrical Times. (W 103)

SALES ENGINEER required as personal assistant to Sales Director for Motor Control Gear company in N.E. London. Excellent prospects for applicant with good electrical training, personality and some experience. Duties include interviewing customers and preparation of tenders and sales literature. Write, stating age, experience and salary required.—Box No. 5067, Electrical Times. (W 177)

SCOTTISH CABLES LTD. require an ELECTRICAL ENGINEER having B.SC. or H.N.C., to take charge of their Cable Accessory Factory. Salary will be in accordance with age and experience. Applications stating full details, to Managing Director, Scottish Cables Ltd., Deanside, Renfrew. (W 124)

Instrument and Meter Department of METROPOLITAN-VICKERS ELECTRICAL CO., LTD.,

have several vacancies for Engineers and Assistants in the sections dealing with Meter Design, Relay Design and Protective Gear Application.

Write for application form, marking envelope "W.3," to:

Personnel Manager,
METROPOLITAN-VICKERS ELECTRICAL CO., LTD.,
Trafford Park, Manchester 17.
(W 180p)

TECHNICAL ASSISTANT required for Design Department of firm manufacturing Electro-Thermal heating systems. Candidates should have good experience in the design of heating installations. Drawing Office and electrical knowledge an advantage. Good salary offered with excellent prospects for advancement. Pension Scheme; apply giving particulars of experience, qualifications, age, etc. to Panelec (Great Britain) Limited, 27 Hatchlands Rd, Redhill. (W 178)

WM. SANDERS AND CO. (Wednesbury) Ltd., require an ENGINEER REPRESENTATIVE in the East Midlands for the sale of their Switchgear, Fuse Distribution Gear and Accessories. Applicants should have a sound electrical knowledge and sales experience. A connection among Users, Contractors, Consultants and Wholesalers in the area is desirable. Car provided. Full details to Sales Manager, Wm. Sanders and Co. (Wednesbury) Ltd., Ridding Lane, Wednesbury. (W 145)

WORKS MANAGER required for Motor Control Gear factory in N.E. London, with 200 employees. Excellent prospects for man with initiative and experience of modern planning methods, production and labour control. Good salary with pension and bonus scheme for applicant with suitable experience. Write to Managing Director—Box No. 5065, Electrical Times. (W 176)

SENIOR SALES EXECUTIVE required, for London Area, by Company manufacturing switchgear and transformers, etc. Experience required in the manufacture and utilisation of such equipment up to 33,000 V. Good contacts required throughout the Electricity Supply Industry. Pension scheme available and salary commensurate with responsibilities. Reply giving details of experience, age and salary required to—Box No. 5049, Electrical Times. (W 102)

WANTED

WANTED—Coil Winding Machine for fine wire gauges up to 46 S.W.G. One Impregnating Plant also required.—Box No. 5029, Electrical Times. (W 25)

WANTED, for prompt cash, ferrous and non-ferrous SCRAP; also plant for dismantling. Buyers of secondhand machinery and plant for re-use.—W. and H. Cooper Ltd., 176 Brady St, Bethnal Green, E.1. (W 1)

WANTED ROTARY CONVERTERS, any size.—Universal, 221 City Rd, London, E.C.1. (W 2)

WORK WANTED

A.C. and D.C. MOTOR REWINDS and REPAIRS. Prompt service fully guaranteed. Edgware 5566 (4 lines).—Service Electric Co., Ltd., Stanmore, Middx. (W 3)

ARMATURE REWINDING service to the trade. Vacuums, Drills, Grinders, Hood Dryers, Dental Motors. Vacuum Cleaner and Drill Armatures replaced from stock 24-hour service. Every job guaranteed. All Vacuum Cleaner parts, hoses, bearings, etc., in stock for any make. Complete overhauls our specialty. Regam Electric Cleaner Service, 95/99 Park Lane, Leeds 1. (W 4)

GLASGOW. Old established firm of Electrical Engineers with commodious premises, centrally situated, and having excellent workshop accommodation are interested in carrying out installations and/or acting as Service Agents on behalf of manufacturers of industrial, commercial or domestic plant. Stocking facilities available.—Box No. 5039, Electrical Times. (W 51)

LET US SOLVE YOUR BREAKDOWN PROBLEMS, repairs speedily carried out by experts. Collection and Delivery by our own transport. A. T. Robinson, Electrical Power Engineers, The Green, Southall, Middx. Southall 3494/5/6. (W 5)

AGENCIES

EXPERIENCED AGENTS required covering Electricity Boards, all districts British Isles. One or two other Agencies not objected to. Give full particulars including remuneration expected.—Box No. 5047, Electrical Times. (W 96)

EXPERIENCED AGENT covering Kent, Surrey, Sussex, Hants, Berks, wants additional agency accessories or domestic appliances. Well established Electricity Boards, Wholesalers, Leading Contractors.—Box No. 5037, Electrical Times. (W 38)

MANUFACTURERS of Mining and Industrial Switch and Control Gear require live AGENTS, with good connections, for (*a*) Lancashire, Cheshire and North Wales; (*b*) West Midlands; (*c*) South Wales. Apply in full to E.R.A., Newspaper House, 61-63 Kyle St, Ayr. (W 125)

FOR SALE

CITY OF BELFAST

REDUNDANT EQUIPMENT

TENDERS are invited for the purchase of seven 500 kW Rotary Converter Equipments.

Form of Tender may be obtained, and equipment inspected, on application at the Electricity Department, East Bridge St, Belfast.

Latest time for receipt of Tenders, 4 *p.m. on Friday*, 30 *Dec.*, 1955.

The following conditions apply to the above mentioned Tender: Each Tender, in sealed envelope marked "Tender for Rotary Converter Equipment, Electricity Committee" and endorsed with the name and address of the Tenderer, must reach the undersigned not later than 4 *p.m. on Friday*, 30 *Dec.*, 1955.

An official receipt must be obtained for each Tender delivered by hand. Tenders sent by post should be registered.

The highest or any Tender will not necessarily be accepted.

JOHN DUNLOP,
Town Clerk.

City Hall, Belfast.
P.O. Box 234.
2 Dec., 1955. (W 187)

A.A. ELECTRICAL CO. for A.C.-D.C. MOTORS, switchgear, exhaust fans, hoists, reduction gears, new or reconditioned units.—Chi. 5105, 67 Rothschild Rd, W.4. (W 7)

A.C. and D.C. MOTORS, GENERATORS from stock.—Service Electric Co., Ltd., Honeypot Lane, Stanmore, Middx. Edgware 5666-9. (W 8)

A.C. and D.C. MOTORS, all sizes, large stocks. Fully guaranteed.—Milo Engineering Works Ltd.; Milo Rd, East Dulwich, S.E.22. (Forest Hill 2278-9). (W 6)

A HIGH VACUUM IMPREGNATION UNIT or single or batch coil impregnation service to R.I.C. specification 214 or individual requirements.—Blickvac, Hamilton Rd Works, Hamilton Rd, S.E.27. Tel. Gipsy Hill 4394. (W 12)

ELECTRIC MOTORS, D.C. and A.C., Motor Generator Sets, Alternators and Dynamos. Reconditioned and guaranteed, very large stocks held.

Britannia Manufacturing Co., Ltd., Britannia Walk, N.1. CLErkenwell 5512-3-4. Stores at Cobham, Surrey. (W 13)

BAND III CONVERTERS

from £4. 12s. 6d. Guaranteed one year. Illustrated details on request.

G. A. STRANGE
North Wraxhall,
Nr. Chippenham, Wilts.
Tel.: Marshfield 236.
(W 52p)

FLUORESCENT SHELLS AND FITTINGS. Highest grade 5 ft Batten Shells with curved end covers from 9s. 6d. Lists of Shells and Fittings by return: Cowling and Holdsworth Limited, No. 1 Factory, Romside Trading Estate, North St, Romford. (W 15)

FOR SALE. Scott connected transformers (2). 3—2-phase, 100 kVA, 50 cycles, 415 V—200 V, 139 A—250 A, manufactured 1948 and 1951 respectively. John J. Dunster and Son Ltd., Grove Crescent Rd, E.15. Maryland 4744. (W 147)

FOR SALE. Complete plant comprising 365 amps/hr Pritchard and Gold Battery of 64 cells, positive plates renewed 4 years ago. Also 28/30 h.p. Vickers-Petter Engine, crude-oil type, built 1923, well maintained, complete with switchboard and Crompton 200 r.p.m. dynamo complete. Inspection by appointment. F. W. Blanshard Ltd., 23 Lansdowne Rd, Purley. UPLands 4818. (W 134)

HOUSE SERVICE METERS, all types, can be obtained by return from Selectrics Dept. E.T., Castle Circus House, Torquay. Phone 7218. (W 14)

MERCURY SWITCHES are made by Hall, Drysdale and Co., Ltd., of 58 Commerce Rd, Wood Green, London, N.22. Tel.: BOW 7221. (W 10)

HOUSE-SERVICE METERS, a.c. or d.c., quarterly or prepayment.—Universal Electrical, 221 City Rd, London, E.C.1. (W 9)

PURLEY CHOKES AND BALLASTS. Our 80-W tapped h.p.f. ballast with starter switchgear-holder incorporated is proving itself the most popular unit. Suitable for most fittings, 57s. 6d. each subject.—F. W. Blanshard Ltd. (Dept. E.T., Purley, Surrey. Uplands 4818-9. (W 11)

TIME SWITCHES from stock. Reconditioned or new. 12 months' guarantee. Lists from J. W. Hughes, 3 St. Thomas St, London Bridge, London, S.E.1. (Tel.: HOP 2759.) (W 16)

11—NEW BROOK R.13, Slip-Ring Motors for sale, 7½ h.p., 1,430 r.p.m., 380/420 V, 3-phase, 50 cycles. F. J. Edwards Ltd., 359 Euston Rd, London, N.W.1. EUSton 4681. (W 190)

MISCELLANEOUS

FREE! Brochure giving details of courses in Electrical Engineering and Electronics, covering A.M.I.BRIT.I.R.E., City and Guilds, etc. Moderate fees. Write to E.M.I. Institutes, Dept. ET. 29, London, W.4. (Associated with H.M.V.) (W 17)

ASSOCIATION OF SUPERVISING ELECTRICAL ENGINEERS

London National Lecture

"THE HEAT PUMP with reference to DOMESTIC INSTALLATIONS"

a Paper by
Mr G. Peter Watson, A.M.I.E.E.,
on
TUESDAY, 20 DEC., 1955.

Lighting Service Bureau, 2 Savoy Hill, London, W.C.2. Commencing 6.30 p.m. preceded by light refreshments from 6 p.m.

Early application for tickets should be made to: General Secretary, Association of Supervising Electrical Engineers, 23 Bloomsbury Square, London, W.C.1. (W 191p)

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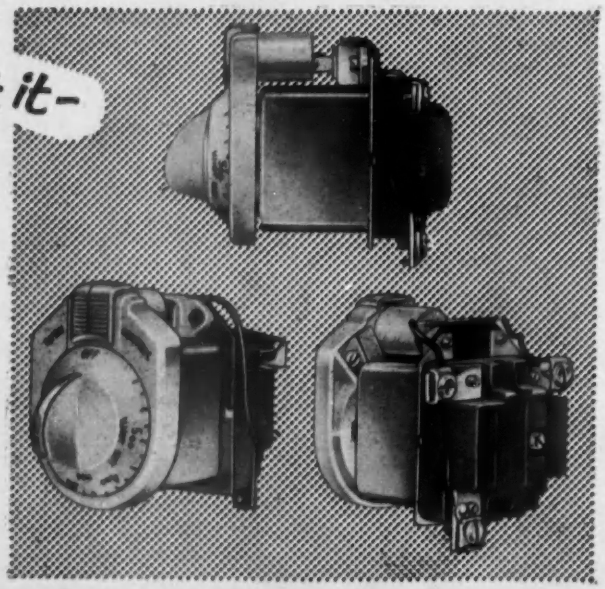

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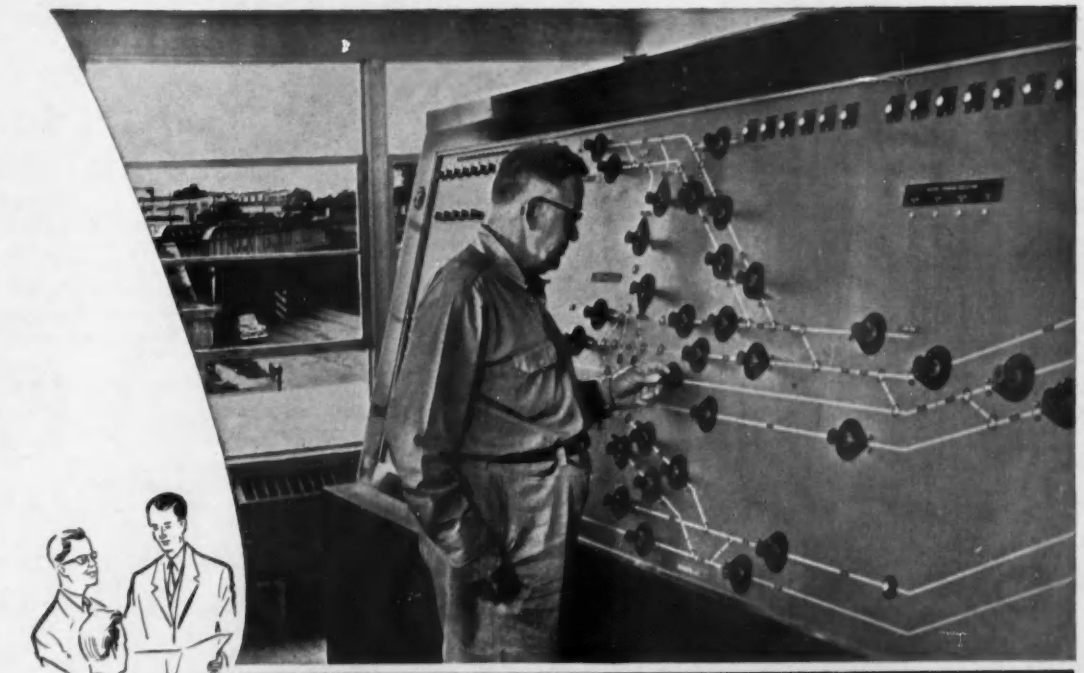

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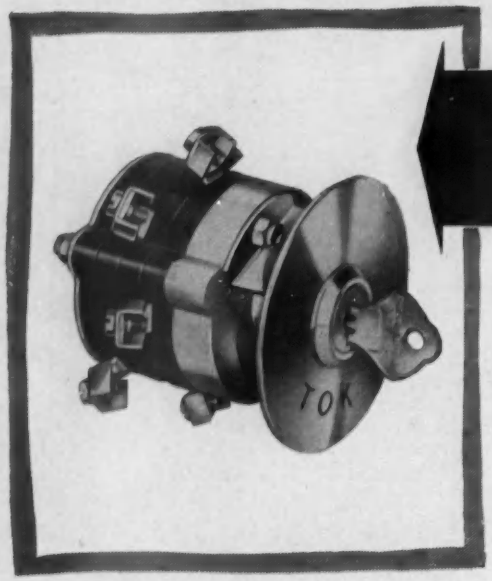

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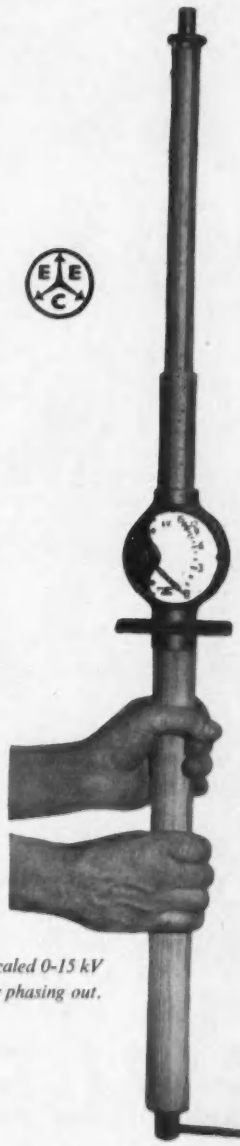

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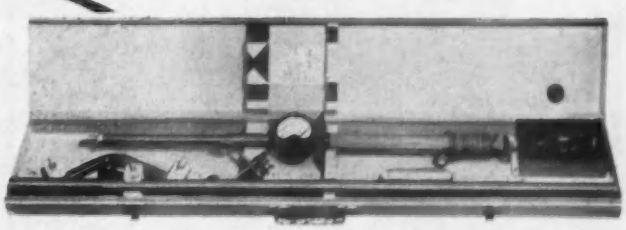

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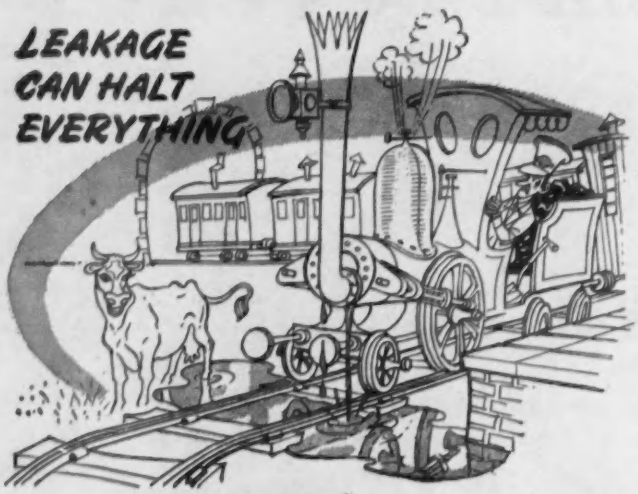

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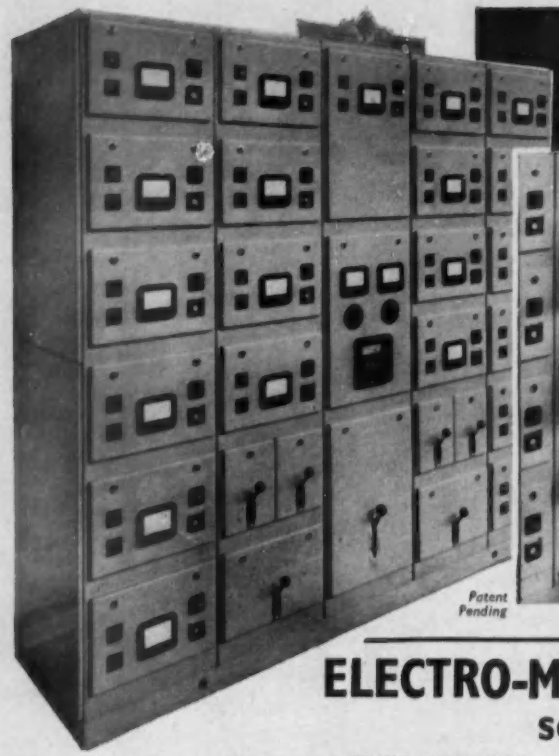

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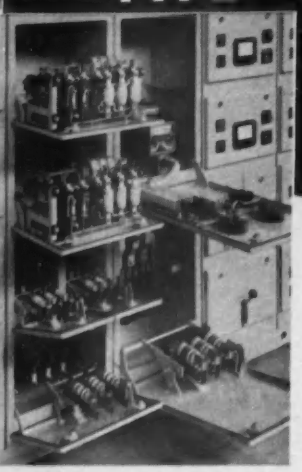

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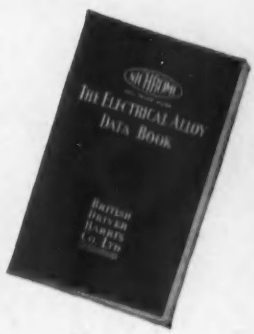

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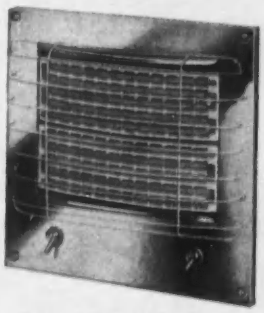

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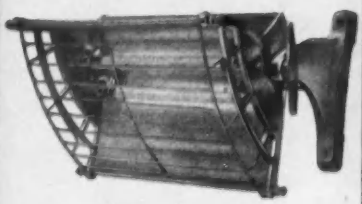

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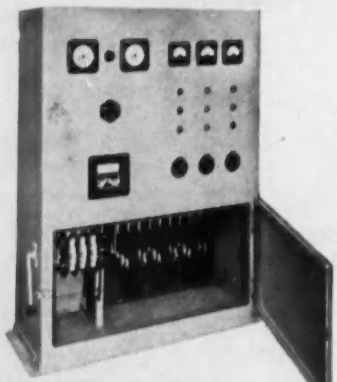

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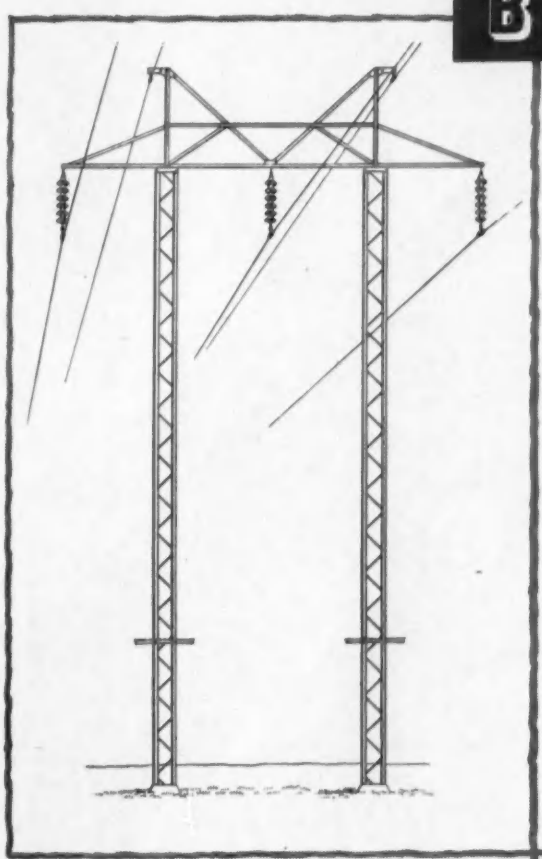

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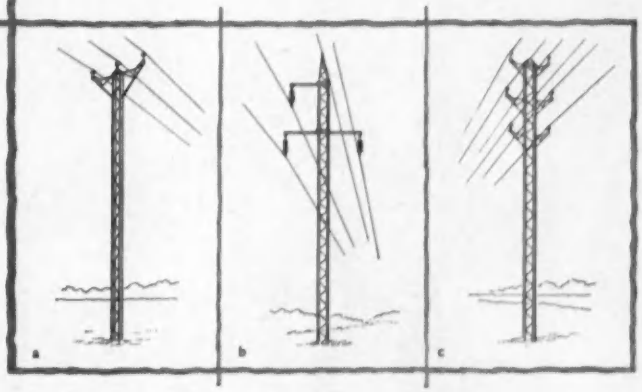

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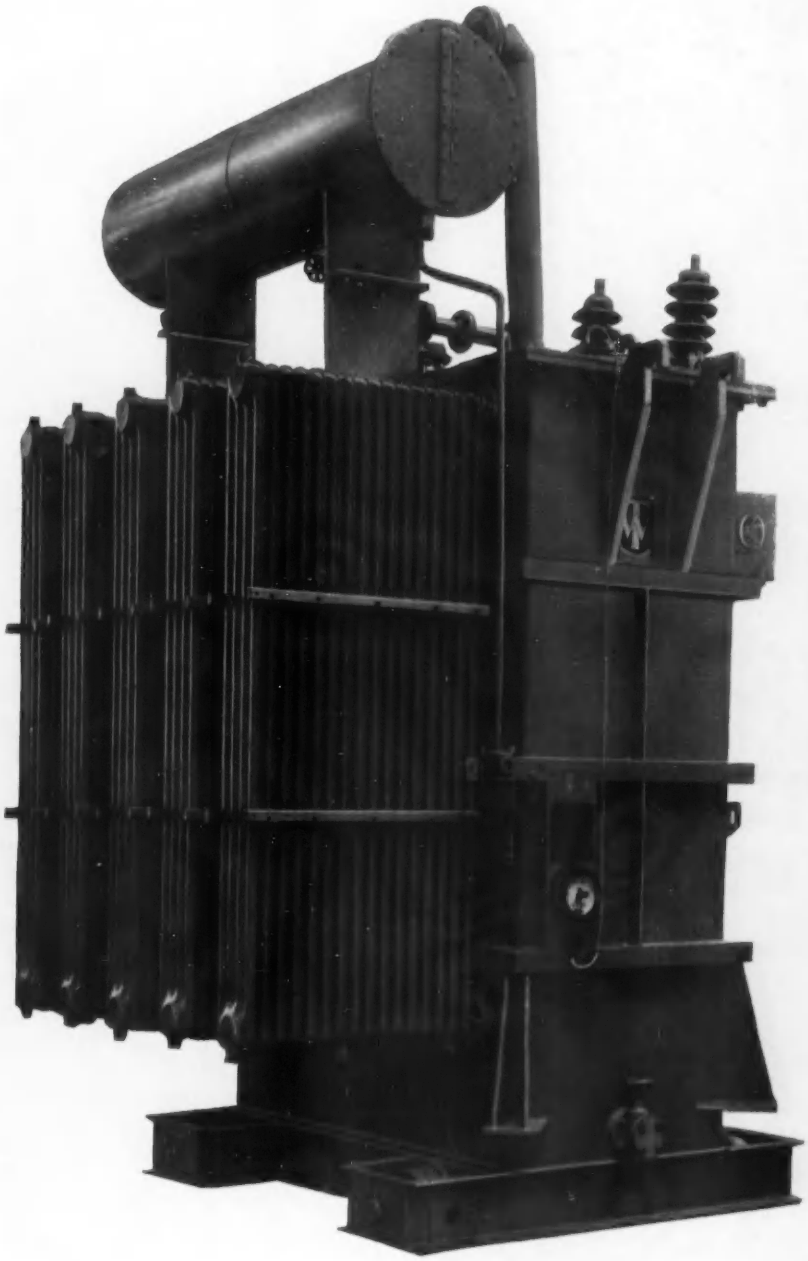

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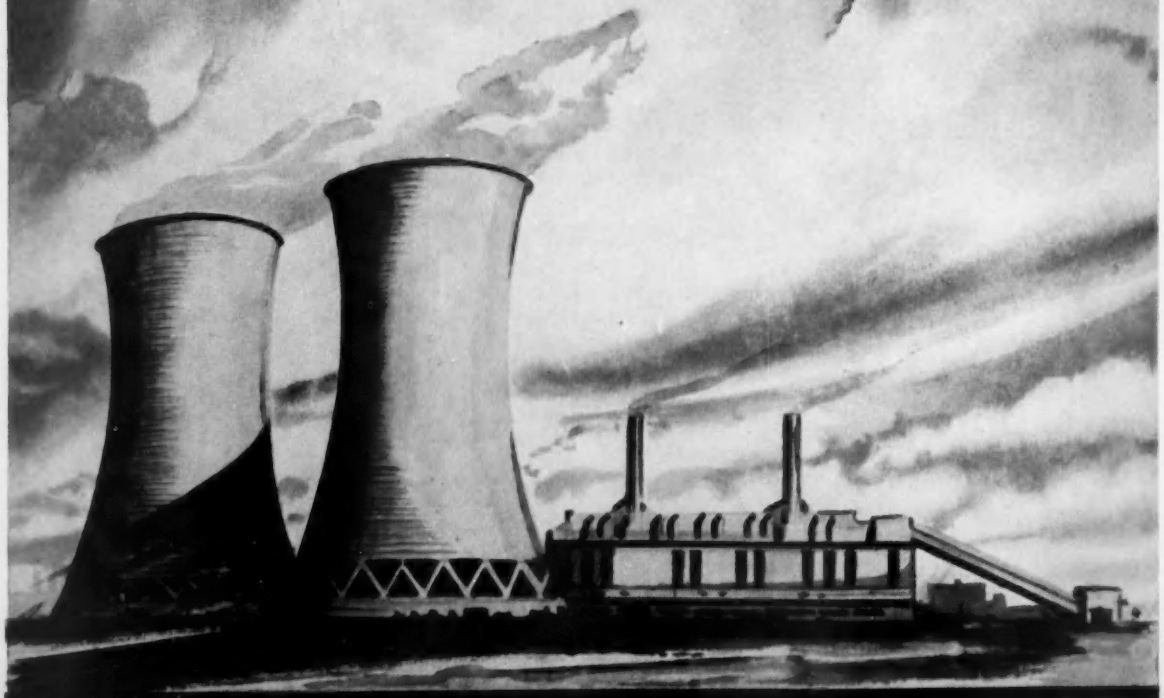

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